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VOL. XXXI MARCH, 1933 No. 3

EDITORIAL

FORESTRY FOR ONE OR ALL USES?

BY EMANUEL FRITZ

Associate Professor of Forestry, University of California

EVERY American forestry student has been taught that the forest has values outside its function as a producer of wood. The American forestry movement was launched, however, primarily on the belief that a timber shortage was imminent and that only through forestry could the country be assured of an adequate perennial supply of lumber. Even our teaching accented wood production as the primary aim of forestry; the other functions were mentioned, but not stressed. That was in the days when our industries and cities were growing rapidly, when lumber was almost the sole building material and had few competitors outside of brick and stone, and when we knew little of the extent of our forest resources. Simple arithmetic did make it appear that a continuation of heedless exploitation would result in an early timber famine. At that time, comparatively few people used the forest for recreation; there was enough water for our domestic and industrial needs and denudation had not progressed to the point where the accompanying erosion looked like anything but a purely local problem. But while we were urging forestry to avoid a lumber shortage, concrete and steel were beginning to make their presence and potentialities felt; stucco and synthetic sheet materials were coming into vogue; new construction began to require less lumber, and we had fewer new areas to develop. Statistics began to take new form and to point away from a timber famine, and lumber, instead of being a leader in the building field, was placed on the defensive. It appeared that a new *raison d'être* had to be found to justify forestry.

It happened that recreational demands upon the forest increased many fold, while several disastrous floods and our enlarged requirements for domestic and industrial water focused attention on the need of safeguarding the vegetative cover of our watershed areas. Recreation, watershed protection, erosion and flood control, and wild life management suddenly burst upon us as forestry functions of commanding importance. Many, talked dry on forestry for wood, seized upon the newly popularized, but already known, indirect forest functions with a vigor that all but eclipsed their earlier fervor for saw-log forestry. Followed article after

article, usually of an elementary and general nature, on water conservation, erosion control, or recreation by the same authors who once expounded upon sawlog forestry. It is probably a failing of humans that they rush from one detail to another as each becomes the talk of the day, and forget for the time the real niche of each or its relation to the major problem as a whole. So it apparently is with us. In the early days of forestry we over-emphasized sawlog production. Today we emphasize the indirect functions at the expense of forestry for wood. Some have gone so far as to claim that wood production is less than secondary to recreational and watershed protection uses. Perhaps true, but only if the forest land is properly classified according to quality, location and other factors and if the claims are confined to restricted areas.

Are we not going a little too far; should we not try to strike a better balance? We must admit the validity of all the uses of the forest already mentioned, plus others. We must admit also their individual and separate importance. But is one to be emphasized over another and are we to allow ourselves to become fadists? Can we not look upon each use in its true light and in its relation to the others?

And how about wood? Is is really a material of the past? If not, why should we not continue to grow trees for saw logs, for poles, crossties, and pulp bolts, but also for recreation, watershed protection, wild life management, and the like all on one great plan? We must have tangible products like saw logs to sell, else we could not afford the great costs of forestry for recreation and the other less measurable uses. At the same time we should not charge all our forest management expense against the saw logs; recreation, the water conservation functions, flood and erosion control, and the others should bear their just share. Wood is hardly out of date even though lumber no longer has its own way as a building material. It may lose even more of its dominance, but it is not likely to drop so far into disuse as to eliminate the need of forestry for producing it. It possesses certain inherent qualities that assure it an important place. Another thing that foresters must not lose sight of is the fact that the growing of saw logs of good quality requires real forestry. In contrast, watershed protection, erosion control, wild life and recreational uses, require hardly even a crude type of forestry. Although some form of silviculture would be highly beneficial, it is at present as unthinkable for these uses, except in special instances, as intensive silviculture is for saw logs. If forestry is to survive as a distinct profession it must have a product to grow and to sell, and foresters must learn to believe in and promote the use of that product. The very limited forestry required by the indirect and incidental uses hardly justifies our present great effort and cost to improve its technique.

NATIONAL PARKS IN CONSERVATION AND LAND USE[1]

By HORACE M. ALBRIGHT

Director, National Park Service, Washington, D. C.

Mr. Albright's paper should be read by every forester who is not familiar with the splendid work of the National Park Service. The author first runs over some of the history of the creation of the national parks and the spirit and plan of their development in which educational and inspirational values are kept uppermost. He then enumerates seventeen principles basic to the policies which should govern the establishment, preservation, protection, use and enjoyment of the national parks. In concluding, Mr. Albright makes a plea for coöperation among agencies interested in conservation and land use.

THE Society of American Foresters has provided more than one opportunity during the past year for the discussion of the national parks in relation to the conservation of the natural resources of the United States. At a meeting of the Washington, D. C., section, early this year, the writer was invited to present a paper on the work of the National Park Service, laying emphasis on its relation to the activities and responsibilities of the Forest Service. The Washington foresters who heard the discussion and saw the slides illustrating the paper were very kind in their comments on the presentation, and officers of the Society at that time expressed the hope that the discussion, enlarged and covering a wider field, would appear in the JOURNAL OF FORESTRY.

The invitation to prepare this paper, coming to me through Dr. E. P. Meinecke, an old personal friend and most valuable technical advisor, affords that opportunity to bring before the annual convention of the Society, and into the pages of the JOURNAL, the essential features of the broad discussion of national parks in the field of conservation that the Washington section of your organization sought from me.

I regret that pressure of official business detains me in Washington, thus preventing active personal participation in the program of the Society, and depriving me of an unusual opportunity for contact with western conservationists, many of whom I have known intimately since college days in Berkeley.

I trust that my classmate, Newton B. Drury, active leader of the Save-the-Redwoods League, in his discussion of this paper will not spare it because of the devoted friendship we have mutually enjoyed since youth.

National parks have been factors in conservation and land use in the United States for sixty years. On March 1, 1872, President Grant signed the Yellowstone National Park Act, reserving and dedicating to public use a great area of 3,348 square miles of wilderness at the headwaters of the Missouri and Columbia Rivers. Today well over 2,500 square miles of wild mountain territory in the park remain in the same condition as when found by the pioneer explorers. The necessary introduction of some 300 miles of highways has modified to some degree the primitive character of perhaps 600 square miles of the park.

The Yellowstone Act established the

[1]Presented at the 32nd annual meeting of the Society of American Foresters at San Francisco, Calif., December 14-16, 1932.

EDITOR'S NOTE: In the absence of Mr. Albright, his paper was read by Ansel F. Hall, Chief Forester of the National Park Service. At the conclusion of the reading he showed a series of well selected colored lantern slides illustrating how the Park Service is endeavoring to design and build various park improvements such as roads, buildings, lookout houses, etc., to fit unobtrusively into the landscape.

first national park in the world. It did much more than this. It created our first great national timber preserve, our first great game sanctuary, our first reserve for scientific research on a grand scale. It influenced the establishment of the first national forests which were withdrawn in 1891 by President Harrison, and which for ten years were protected and administered by the Yellowstone park patrols. These, now the Shoshone and Teton National Forests, then were the Yellowstone Timber Reserve.

Forty years before the Yellowstone Act, in 1832, Congress had enacted a law reserving four sections of land, which included the Hot Springs of Arkansas. These springs were believed to be of incalculable value to the American people, —white, black and red,—and although squatters finally secured title to some of this reserved land in the foothills of the Ouachita Range, the bulk of the highlands and forests and all the springs have been protected by the United States for a hundred years.

Again, in 1864, the Yosemite Valley and the Mariposa Grove of Big Trees were reserved and transferred to California, another step in land conservation and use, but a mistaken one in this case, because California was apparently not yet old enough to be entrusted with the care of such natural features so lovely and precious as the "Incomparable Valley" and the famous Mariposa Grove of giant trees. In 1906, these areas were re-ceded to the United States and became a part of Yosemite National Park which had been established in 1890. Sequoia and General Grant National Parks were also reserved in 1890. Grand Canyon Park was first proposed in 1886 by Senator—later President—Benjamin Harrison of Indiana. The Park was created in 1919.

If Congress had kept the national parks together in one Department, as established, the historical parks would be found in the list as of 1890, because Antietam and Chickamauga Military Parks were created that year. Shiloh National Military Park followed in 1894 and Gettysburg in the same year.

Mount Rainier National Park in Washington, which had been under discussion in Congress for several years, was finally reserved in 1899. Crater Lake followed in 1902, and the same year another medicinal-spring park — Platt — was carved from an Indian Reservation but with the thought that it would be transferred sometime to a state that would include Indian Territory. In 1903 Wind Cave was reserved in South Dakota. Thus up to 1906, in the midst of the administration of the greatest of all conservationists in the highest places—Theodore Roosevelt—the United States had created two mineral and hot spring reservations regarded as important to the nation, one cave park, and six mountain national parks in the west, the latter containing outstanding scenery and exceptional biological and geological exhibits of transcendent value to the country and the world. It had also established four historical parks including Civil War battlefields.

Meantime, the national forests under the name "forest reserves" were being established under the General Land Office in the Interior Department, and in 1905 were transferred to the administration of the Forest Service in the Department of Agriculture. It is needless to record here the marvelous growth of this fine bureau, one of the most efficient, high-spirited organizations in the United States Government and one of the most successful and respected of all federal agencies. It is eleven years older than the National Park Service.

Since the six scenic national parks then existing were in the western mountains, they contained unusually fine forests in primitive condition. Many of the national parks created since 1905 likewise protect

splendid forests. The new Great Smoky Mountains National Park in North Carolina and Tennessee embraces upwards of 200,000 acres of virgin southern hardwood timber.

It was natural in 1905, as it is today in some places, to regard the national parks as forest parks, because some members of the system do contain vast tracts of original American forests untouched by the woodsman, but it never was the intention of Congress that the national park system should merely preserve forested areas.

It was in 1906, the year following the establishment of the Forest Service, that Congress defined clearly the course it was pursuing in park making. It passed two laws sponsored by another great conservationist, John W. Lacey of Iowa. The first was the Antiquities Act of June 8, 1906, authorizing the President to establish national monuments by proclamation, to protect lands containing "historic landmarks, historic and prehistoric structures, and other objects of historic or scientific interest" that are situated upon lands owned or controlled by the Government of the United States."

The Grand Canyon, Zion, Lassen, Bryce Canyon, and other parks were saved from commercial exploitation by first receiving the monument status, and our present national monument system grew through the wise exercise of executive power under this particular Lacey Act. Something over half of the national monuments are under the National Park Service.

The other 1906 Lacey Act established Mesa Verde National Park in southwest Colorado, a park that has forests which are quite incidental to its other natural features and its archeological exhibits.

There was never any doubt in President Roosevelt's mind about the need for national parks. He quickly signed all good park bills coming to him. In his article in *Field and Stream* in 1904, entitled "Wilderness Reserves," he told of his trip in 1903 to Yellowstone, Yosemite and Grand Canyon. He said:

"In May, after leaving the Yellowstone, I visited the Grand Canyon of the Colorado, and then went through the Yosemite Park with John Muir—the companion above all others for such a trip. It is hard to make comparison among different kinds of scenery, all of them very grand and very beautiful, but nothing that I have ever seen has impressed me quite so much as the desolate and awful sublimity of the Grand Canyon of the Colorado. I earnestly wish that Congress would make it a national park—,"

and again at the end of the article:

"Surely our people do not understand even yet the rich heritage that is theirs. There can be nothing in the world more beautiful than the Yosemite, the groves of Giant Sequoias and redwoods, the Canyon of the Colorado, the Canyon of the Yellowstone, the Three Tetons; and our people should see to it that they are preserved for their children and their children's children forever, with their majestic beauty all unmarred."

Following President Roosevelt came President Taft, with his park contributions to conservation—the exquisite Glacier National Park in Montana, nearly a dozen national monuments, and a special message to Congress urging the establishment of a bureau to administer the park system.

President Wilson in 1913 appointed Franklin K. Lane of California as his Secretary of the Interior, and two years later Secretary Lane induced Stephen T. Mather, an old college friend, to become his assistant. The National Park Service was created by act of Congress in 1916, and in 1917 was organized with Mr. Mather as its director. Seven new parks were added to the system in President Wilson's administration—Rocky Mountain in 1913, Hawaii and Lassen in 1916, Mount McKinley in 1917, and Zion, Grand Canyon and Acadia in 1919, and

the national monument group was further expanded.

In 1926, a definite move to expand the National Park System to the East was made with the authorization of the Great Smokies, Shenandoah and Mammoth Cave national parks—the land to be acquired without expense to the United States. These projects are succeeding.

Mr. Mather's last year as director saw Bryce Canyon receive national park status.

In 1929, Grand Teton entered the park system, and a year later Great Smoky Mountains National Park and Carlsbad Caverns were formally admitted.

Also in 1930, the Colonial National Monument, including Yorktown Battlefield and Jamestown Island, and George Washington Birthplace National Monument were established. They definitely marked the beginning of a new program of historical park development which must inevitably mean bringing the parks and monuments in the War Department to the National Park Service.

The Isle Royale National Park in Michigan was authorized in 1931 and the Everglades project in Florida was advanced by United States Senate approval.

Today the National Park System of the United States includes 22 national parks with a total area of 8,417,261.53 acres, 12 military or historical parks under the War Department, with 13,801 acres, 75 national monuments, distributed as follows:

Department	*No.*	*Area*
Interior (National Park Service)	36	4,166,269.74
War	24	1,197.1
Agriculture (Forest Service)	15	359,110.
	75	4,526,576.84

Many of the parks and monuments under the National Park Service contain mountain areas with splendid forests, but some also contain arid areas with nothing but typical desert plants. They embrace vast areas of crags, towers, and domes, devoid of all plant life save perhaps lichens and other like forms. Large sections are covered with ice of glaciers, while snow fields hide other tracts except for a few weeks each year. As a matter of fact, these scenic features other than forests constitute the chief exhibit of a national park and the one which assures its standard as a park.

Every acre of these parks and monuments is to be forever preserved in its natural state for the benefit of this and future generations. The first duty of the National Park Service is to protect its precious charges. There is no commercial exploitation, no cutting of timber, no development of power, no mining except in one or two special cases, no hunting of wild life, and no grazing except in a few special cases.

Facilities for enjoyment of the parks are essential and therefore are authorized. This means roads, trails, telephone lines and buildings. A force of over 20 landscape architects is preparing master plans covering areas that may be opened to general public use, together with proposals for road and other so-called "improvements." Plans for development, either by the government or its concessioners, must receive the approval of the landscape architects and the director. Beautiful roads that are fitted to the topography after most careful planning are now under way, buildings of stone and wood that harmonize with their environment are taking the place of old structures. Power and telephone lines are going underground in cables or in narrow clearings through the forest some distance from the highways.

Careful studies of vacation travel, especially in the national parks, lead us to believe that there should not be greatly increased demands for new roads. It is true, however, that local people residing near our parks would be pleased to have new roads projected, new fishing streams made accessible, new camp grounds

opened. But it should be borne in mind always that only a small proportion of the total area of our national parks is accessible except by trail.

Immense areas of the parks are reserved from all development. They are to remain as our great wildernesses to thrill our children and their descendants for all time to come. They are bits of the old America that the Indian, the trapper, the pioneer settler knew.

The spirit of the national parks and monuments is wholly different from the typical vacation resort, summer or winter, and these areas are fulfilling the part Congress intended them to play in land conservation and use. There can be no doubt of this.

The National Park Service does not attempt to meet the ordinary demands for vacation entertainment. We discourage motion picture shows and all forms of cheap beach-resort type of amusement. Most parks have no motion picture exhibitions, except in connection with our educational work. Entertainment is kept on a high plane, with the educational and inspirational values of the parks emphasized carefully but none the less surely. Appreciation of nature in the scenic parks and monuments, and the fascination of archeology and history in the historical parks and monuments, are the bases for our programs.

These and other features of our program of conservation and land use in the national parks have not been put into practice by sudden inspiration. They have gradually evolved during a period of almost two decades of specialization in this unique field of administration. You who are engaged in the well established field of general forestry may not realize how workers in our new profession of recreational administration must frequently meet perplexing problems—problems in which there can be no reference to precedent.

But, even though we have developed our administrative practice by empirical methods, we have nevertheless been giving attention to the principles underlying park administration. We have not yet worked out these principles with ultimate finality, but can at this time present a preliminary statement that has been drafted with the help of Hon. Louis C. Cramton who served so many years as chairman of the House Appropriations Committee and who played a part in building the national park system that ranks in importance second only to the great achievements of Stephen T. Mather. Mr. Cramton was asked to make a careful study of the Congressional Record and of all other legislative documents relating to Yellowstone National Park, to determine what Congress, in initiating the park system, intended the national parks to be, and what policies it expected would govern the administration of the parks.

The results of the study, which is not yet completed, can best be set forth in a statement of policy as follows:

1. A national park is an area maintained by the federal government and "dedicated and set apart for the benefit and enjoyment of the people." Such federal maintenance should occur only where the preservation of the area in question is of national interest because of its outstanding value from a scenic, scientific, or historical point of view. Whether a certain area is to be so maintained by the federal government as a national park should not depend upon the financial capacity of the state within which it is located, or upon its nearness to centers of population which would insure a large attendance therefrom, or upon its remoteness from such centers which would insure its majority attendance from without its state. It should depend upon its own oustanding scenic, scientific, or historical quality and the resultant national interest in its preservation.

2. The national-park system should

possess variety, accepting the supreme in each of the various types and subjects of scenic, scientific, and historical importance. The requisite national interest does not necessarily involve a universal interest, but should imply a wide-spread interest, appealing to many individuals, regardless of residence, because of its outstanding merit in its class.

3. The twin purposes of the establishment of such an area as a national park are its enjoyment and use by the present generation, with its preservation unspoiled for the future; to conserve the scenery, the natural and historic objects and the wild life therein, by such means as will insure that their present use leaves them unimpaired. Proper administration will retain these areas in their natural condition, sparing them the vandalism of improvement. Exotic animal or plant life should not be introduced. There should be no capture of fish or game for purposes of merchandise or profit and no destruction of animals except such as are detrimental to use of the parks now and hereafter. Timber should never be considered from a commercial standpoint but may be cut when necessary in order to control the attacks of insects or diseases or otherwise conserve the scenery or the natural or historic objects, and dead or down timber may be removed for protection or improvement. Removal of antiquities or scientific specimens should be permitted only for reputable public museums or for universities, colleges, or other recognized scientific or educational institutions, and always under department supervision and careful restriction and never to an extent detrimental to the interest of the area or of the local museum.

4. Education is a major phase of the enjoyment and benefit to be derived by the people from these parks and an important service to individual development is that of inspiration. Containing the supreme in objects of scenic, historical, or scientific interest, the educational opportunities are preëminent, supplementing rather than duplicating those of schools and colleges, and are available to all. There should be no governmental attempt to dominate or to limit such education within definite lines. The effort should be to make available to each park visitor as fully and effectively as possible these opportunities, aiding each to truer interpretation and appreciation and to the working out of his own aspirations and desires, whether they be elementary or technical, casual or constant.

5. Recreation, in its broadest sense, includes much of education and inspiration. Even in its narrower sense, having a good time, it is a proper incidental use. In planning for recreational use of the parks, in this more restricted meaning, the development should be related to their inherent values and calculated to promote the beneficial use thereof by the people. It should not encourage exotic forms of amusement and should never permit that which conflicts with or weakens the enjoyment of these inherent values.

6. These areas are best administered by park-trained civilian authority.

7. Such administration must deal with important problems in forestry, road building, and wild life conservation, which it must approach from the angles peculiar to its own responsibilities. It should define its objectives in harmony with the fundamental purposes of the parks. It should carry them into effect through its own personnel except when economy and efficiency can thereby best be served without sacrifice of such objectives, through coöperation with other bureaus of the federal government having to do with similar subjects. In forestry, it should consider scenic rather than commercial values and preservation rather than marketable products; in road building, the route, the type of construction and the treatment of related objects should

all contribute to the fullest accomplishment of the intended use of the area; and, in wild life conservation, the preservation of the primitive rather than the development of any artificial ideal should be sought.

8. National park administration should seek primarily the benefit and enjoyment of the people rather than financial gain and such enjoyment should be free to the people without vexatious admission charges and other fees.

9. Every effort is to be made to provide accommodations for all visitors, suitable to their respective tastes and pocketbooks. Safe travel is to be provided for over suitable roads and trails. Through proper sanitation the health of the individual and of the changing community is always to be protected.

10. Roads, buildings, and other structures necessary for park administration and for public use and comfort should intrude upon the landscape or conflict with it only to the absolute minimum.

11. The national parks are essentially non-commercial in character and no utilitarian activity should exist therein except as essential to the care and comfort of park visitors.

12. The welfare of the public and the best interests of park visitors will be conserved by protective permits for utilities created to serve them in transportation, lodging, food, and incidentals.

13. The national interest should be held supreme in the national park areas and encroachments conflicting therewith for local or individual benefit should not be permitted.

14. Private ownership or lease of land within a national park constitutes an undesirable encroachment, setting up exclusive benefits for the individual as against the common enjoyment by all, and is contrary to the fundamental purposes of such parks.

15. National parks, established for the permanent preservation of areas and objects of national interest, are intended to exist forever. When, under the general circumstances such action is feasible, even though special conditions require the continuance of limited commercial activities or of limited encroachments for local or individual benefit, an area of national-park caliber should be accorded that status now, rather than to abandon it permanently to full commercial exploitation and probable destruction of its sources of national interest. Permanent objectives highly important may thus be accomplished and the compromises, undesired in principle but not greatly destructive in effect, may later be eliminated as occasion for their continuance passes.

16. In a national park the national laws and regulations should be enforced by a national tribunal. Therefore, exclusive jurisdiction of the federal government is important.

17. National monuments, under jurisdiction of the Department of the Interior, established to preserve historic landmarks, historic and prehistoric structures, and other objects of scientific or historical interest, do not relate primarily to scenery and differ in extent of interest and importance from national parks, but the principles herein set forth should, so far as applicable, govern them.

Perhaps some of these principles should be amplified, but we believe that they stated in a brief way the policies which should govern the establishment, preservation, protection, use, and enjoyment of the national parks.

As originally set aside the national parks have not always been administrative units. Quite frequently it has been necessary for us to work with the Forest Service and other bureaus in an attempt to round out areas so that they could be efficiently operated and would at the same time include natural features which are patently of national park calibre. Even

now there are a few areas where such readjustments should be made, and I hope that these proposed changes can be considered from the point of view of public welfare expressed in the statement of principles outlined above.

We should think of conservation and land use not merely in connection with the national parks but also in connection with the areas administered by the other conservation bureaus. Such bureaus can be greatly aided by the eternal vigilance of organizations such as the Society of American Foresters, the American Civic Association, and their allies. There must be no retrogression in the conservation movement. There *will* be none if the unreserved public land question can be correctly solved and the conservation bureaus seize every opportunity to coöperate with each other.

COMMENTS[1]

By NEWTON B. DRURY

Secretary, Save the Redwoods League

ALTHOUGH I can make no claim to be a forester I feel perfectly at home in this gathering because for almost fourteen years it has been my privilege, first in working for the Save the Redwoods League and for the last few years in the acquisition of state parks in California, to have very close association with members of the federal and state forests and with other forestry interests, and I feel that, in California particularly, parks and forests are so closely interrelated that it is impossible entirely to dissociate them. The state is close to 25 per cent a forested state. Our program of state parks in California, which has more or less grown out of the Save the Redwoods program, has now expanded into a conservation system which includes all types of natural areas; but about half of our expenditures have been for forest parks and I know that all of you here will be interested to know, as many of you doubtless already do, of the outstanding acquisitions of the State of California. In the northern part of the State we have almost 20,000 acres in the Bull Creek and Dyer watersheds, almost 6,000 acres in Prairie Creek, north of Eureka, and 2,500 acres in Humboldt and Del Norte Counties. There has also been acquired the first discovered grove of the big trees of the Sierra, the Calaveras North Grove, and recently the splendid news has been announced that the State Park Commission has been able to effect the preservation of the only natural habitat of the Monterey cypress by acquiring the Point Lobos area. There are forests in some of the state parks in southern California, also state parks in some of the most typical areas of the pine belt. The state has 34 parks at the present time, comprising 67,000 acres, representing a value of about $12,000,000. It is very interesting to contrast these figures with those given by Mr. Albright for the national parks, with their 22 parks and eight million acres. The State of California is endeavoring through its park system to supplement the national parks and national monuments by acquiring those gems of natural

[1]Presented at the 32nd annual meeting of the Society of American Foresters at San Francisco, Calif., December 14-16, 1932.

beauty which, because of small size or other reasons, have not been incorporated in the national park system or in forests.

My conception of my function as a leader of discussion on this presentation of principles is that it is not necessarily a matter of expounding my own views but more perhaps of acting as Devil's advocate in endeavoring to point out one or two questions which must arise, in the minds of foresters particularly, in a discussion of such principles of park conservation and management.

In discussing the paper of my distinguished former classmate, and in spite of his kind references to me, I wish he were here in person because it is always easier to have comment on a subject with the author on the ground. It seems to me there are certain outstanding questions which all of us who are interested in parks and forests should ask ourselves. I will confine myself to three or four definite lines of inquiry which I hope will lead to discussion of basic principles. They affect not only the acquisition of parks but also their management.

We can agree that the primary purpose in the establishment of parks is to preserve in a state of nature outstanding areas of natural beauty and places of historical interest. On this basis the first question is, how should the burden of doing this be distributed? No private attempts to preserve such areas on a large scale have been permanently successful. It is a function of government, federal, state or in some cases local. The question as to where this burden should be placed relates not only to the burden of administration but to the burden of financing. Is it the function of a governmental agency, whether nation or state, or even a locality, to furnish free to the users of these areas facilities for which the body politic as a whole has met the cost? There is a definite question in the minds of the state authorities in California whether the special services to which parks are devoted should be defrayed by those who enjoy the special use or met by the community as a whole. The tax payers have made the initial investment. Those who get the enjoyment of the privileges should meet part of their cost. It is already announced that at Point Lobos a toll charge for automobiles entering the area has been adopted, for the present, as a policy. This is partly as a measure for the protection of the beauty of the area itself, partly for the protection of the state budget.

Granted that our purpose is to preserve a state of nature, the second question is, to what extent can this purpose be carried? I raise this not in any business sense, because I am in the camp of those who believe that we have a long way to go before we reach the saturation point. I believe that, no matter how many natural areas we preserve in parks, one hundred years from now the generations which follow us will feel we did not do enough. There is no question, however, but that is one of the issues that is being discussed, particularly among those who look upon these as reservations of usable natural resources. There is some limit to the bottling up of natural resources. It has an effect upon industries, and also upon localities. The first objection in some counties to saving the redwoods was that it would remove from industry some of the cream of the forests of the redwood belt. The other side of the picture is that in this area are communities and counties which have counted upon the revenues from taxation. Fifty per cent of the taxable values are in timber. Deeding to the state an area as large as Bull Creek Flat has taken off the tax roll close to $40,000 a year. How can a balance be struck? How far are we justified in exercising this particular form of conservation, and in holding forever these resources inviolate?

Another question is the extent to which

it is possible to keep natural areas in a so-called state of nature. Nature is a changing thing. A point particularly manifest, even in the national parks, is that people are gregarious and like to herd together. There tends to be concentration of use in the most precious areas and this rapidly tends to destroy the very qualities sought.

Finally, how can such areas be managed so as to give to the people the enjoyment for which the areas were created and still keep the qualities from which the enjoyment springs? Dr. J. C. Merriam once said, in a rare moment of discouragement, that we were apparently trying to provide for all the people the benefits of solitude, all at the same time.

These, then, are the questions I should like to leave with you:

1. Where should the burden of administration rest?

2. How far can we go in sequestering otherwise usable natural resources in parks?

3. To what extent is it possible to obtain the values which we seek and still maintain the balance of nature which will preserve those values?

4. How can the balance be struck, a program worked out in such a way that there will be true balance?

Income from Recreation Sources

New England's annual income from recreational sources amounts to $500,000,000 and, if this is considered as a 6 per cent return on a capital investment, it would place the current economic value of New England's recreational assets at about 8-1/3 billion dollars. The value of the recreational property in New England is placed at $550,000,000 and taxes amounting to $15,000,000 are paid on this property. The recreation dollar is spent as follows: Transportation 20 cents; accomodations 20 cents; retail stores 25 cents; food 21 cents; amusements 8 cents; confections 6 cents.

CONSERVATION AND LAND USE IN STATE FORESTRY[1]

By LEWIS E. STALEY

Secretary, Pennsylvania Department of Forests and Waters

PROBABLY the best method of attacking a general subject is by way of concrete cases. Therefore, I shall briefly review conservation and land use as developed in the Pennsylvania forestry policy.

Pennsylvania has long recognized three major productive uses for large areas of land. They are: Agriculture, forestry and grazing. Of these, the growing of forest trees is least exacting in soil fertility, and will succeed after the other two have failed. More recently recreation in all its varied forms has been developed, and is now an outstanding and important feature of forest land use.

Ernest Bruncken, writing in the *Forestry Quarterly* twenty-five years ago, defined an ideal economic organization of a country as, "one where each parcel of land was devoted to the use by which the highest wealth could be produced on the totality of the land."

Two conditions above all others influence the productivity of land. The first is fertility which is determined by kind of soil, drainage and climate, and which changes very slowly unless influenced by erosion or floods; the second is, relative location, which is determined by current transportation and distance from market, and which is continually changing as new markets occur and population rises and falls.

Pennsylvania first adopted the principle of state ownership of forest land in 1897, when Governor Hastings signed two companion bills looking toward reforestation. The first law authorized the purchase of unseated forest land at county delinquent tax sales, and had in view the preservation of water supplies at the sources of the main rivers of the state, and the protection of the people of the Commonwealth and their property from destructive floods. The second law had a similar purpose in view, and authorized the purchase of three forest reservations of not less than 40,000 acres each on the headwaters of the Delaware, Susquehanna, and Ohio Rivers. The first justification for state forest land ownership in Pennsylvania is notably based on water supply and flood prevention, just as the first national forests, and particularly their extension by purchase under the Weeks Law of 1911, were justified by the plea of protection of navigable stream watersheds and interstate water supplies.

Since 1897, the purpose for which forest land is acquired by Pennsylvania has been much widened and re-stated. It provides for the acquisition of potential forest land—"in the name of the Commonwealth by purchase, gift, or condemnation, and hold as State forests subjects to such reservations, if any, of mineral rights, stumpage rights, rights-of-way, or other encumbrances, as the Department and the State Forest Commission deem to be consistent with such holding any lands which in the judgment of the Department, the Commonwealth should hold, manage, control, protect, maintain, utilize and regulate as State forests."

Thus it may be seen that any lands in

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[1]Presented at the 32nd annual meeting of the Society of American Foresters at San Francisco, Calif., December 14-16, 1932.

the state, which the Department and the State Forest Commission deem desirable for state forests are eligible, subject only to first, a $5.00 and now a $10.00 limit acre price, and subject further to specific appropriations for that purpose by the Legislature. The implication in the price limitation is that the lands purchased must have been cut over, and that the state forest policy is one of reforestation. The chief criticism of the policy is that it was adopted entirely too late in the lumbering history of the state. Subsequent repeated fires have so damaged the soil and prevented forest restocking that forest restoration is a long and costly process. Unfortunately, there has been no assured continuous policy for acquisition of a definite amount of forest land annually. The purchase policy has been subject to acquisition victories and defeats, and has on the whole proceeded so slowly that in many mountain forest counties a serious local problem in the form of tax delinquent forest lands has developed.

In Centre County, for example, the average unseated land sold at biennial tax sales and not redeemed by former owners averaged 23,000 acres from 1900 to 1912, and 22,000 acres from 1914 to 1928. This stepped up to almost 43,000 acres in 1930. The 1929 and 1930 delinquencies advertised for sale in 1931 and 1932 amounted to 59,000 acres. These tax delinquent forest lands sold and not redeemed represent about nine per cent each two years of the total of this class of land in the county from 1900 to 1928; 16 per cent in 1930 and 24 per cent advertised for sale in 1931 and 1932. The county already holds title to over 28,000 acres of this land, or 12 per cent of the total area which private buyers refused to purchase for the amount of two years' delinquent taxes.

On the other hand, the seated farm and forest acreage of tax delinquent lands was negligible up to 1930. While they showed a sharp increase in 1930 and 1932 the total advertised in 1932 to date is 3,297 acres or less than one-half of one per cent of the total area.

Thus, in spite of the fact that Centre County has one of the lowest average unseated forest land tax burdens in the state, and that the state defrays a large part of the cost of forest protection on private lands, private forest land ownership is failing. Even the present considerable, though spasmodic state purchase of this class of land has not prevented this material falling down of private cut-over forest land ownership. Had it not been for the gambling chance of selling the lands to the state before the taxes caused private insolvency, it would have been much worse.

In counties where the forest is a much smaller percentage of the land area, and forest holdings are largely limited to farm woodlots, private forest ownership has not fallen down as badly. The farmers have not stopped to analyze the extra tax burden on the farm caused by the farm woodlot, until now in many cases the total tax is becoming insupportable for the poorer soils with present low farm product prices.

In addition to the failure of private ownership to carry increasing areas of cut-over forest lands in Pennsylvania, the idle and increasing tax delinquent cleared lands are fast becoming a problem. A review of census figures and a recent survey of 17 counties shows that cleared land in Pennsylvania farms has decreased 1,500,000 acres from 1890 to 1910, and 2,300,000 acres from 1910 to 1930. These idle lands, after allowing for natural reforestation comprise one-seventh of the area of the state and they present serious problems of soil erosion, tax delinquency, failing forest industries, increased lumber costs for the people of the Commonwealth, and other minor but costly local

problems. On the other hand, if these lands are reforested, they offer a chance of increasing the much-needed coniferous forest stand of the state and along with the potential employment of the restored state forest lands, they offer an opportunity of keeping many mountain farmers from ultimately dropping much additional farm land into idle and delinquent areas.

It is not a coincidence that farm land in use in the state reached its peak with the lumber cut, and has been falling ever since 1900, when the lumber cut started its precipitous decline. Agriculture on thousands of farms can succeed only when part time winter work in nearby forests is available on much agricultural land in the mountain counties. Although the problem of American agriculture at present is one of over-production, the forest growth of the Nation bears a relation to forest drain of only 7 to 16 or less than 44 per cent. In Pennsylvania, in normal years, we import more than 80 per cent of our wood, which is the strongest argument that we have much further to go in balancing our forest products budget than the country at large. Private capital will not carry reforestation through to maturity on much of this land. This being true, it becomes a problem for the state and although a long time project, financial success is assured if conservatively managed.

Pennsylvania will never be in danger of over-supplying her home wood market as to total output. We may have a surplus of hardwood thinnings while bringing her forest stand up to saw timber and other large-sized products during the next fifty years, but her home market for fuel, mine timber, and the rapidly growing technique in the manufacture of paper, fibreboard, rayon, and plastics, may even be able to utilize the temporarily large quantity of forest thinnings material. The state is financially safe in continuing her forest land purchase, and in embarking on an idle land reforestation policy larger than has been heretofore possible.

The Pennsylvania state forests now contain 1,586,358 acres and the public is coming to enjoy these generally scenic areas more rapidly as outing grounds for summer camps, hunting, and fishing and day excursions and picnics. The policy of leasing camp sites is growing in popularity, and during the depression is producing an increasing revenue. The growth of this use of state forests may be illustrated by Table 1.

TABLE 1

GROWTH OF CAMP SITE LEASES

Year	Number of camp sites	Annual rental
1910	38	$ 138.00
1920	572	3,712.50
1930	2,319	22,170.87
1932	2,665	26,468.46

These ten-year sites are carefully chosen with a view of protecting watersheds, places desirable for more intensive use such as tourist camps, administration sites, picnic parks, and free temporary camps.

The spirit of recreation is nation wide, and annual expenditures for its enjoyment run into billions of dollars. Public recreation is a rapidly expanding phase of American life. In general it is a reflection of material well being and an increasing appreciation of spiritual value. So long as recreation is indulged in freely by all classes of people, we have a sound and healthy economic and social life.

The productive use of leisure time and the continued participation in wholesome outdoor recreation rests upon the maintenance of accepted standards of American life. As a country, we have been singularly blessed in the wealth of raw materials, but we cannot indefinitely draw upon our capital and adequately meet the economic pressure and social demands of a fast-

growing population. Such a policy condemns our administration of a heritage we hold in trust for future generations.

We must provide new capital. Nature has provided natural beauty almost beyond comprehension in the mountains and valleys of our country, but man must keep them clothed with trees and provide the necessary desirable and effective agencies to supplement nature's gift. In our forestry plan, we must not leave out correlated forms of land use. With this treatment of our forests, recreation will rest upon a firm and economic basis, and forest development will go forward much more rapidly than can be expected otherwise.

Forestry and recreation in Pennsylvania are considered co-partners in the reforestation movement. In my judgment they are inseparable. One cannot be held back except to the detriment of the other. Perhaps I can give you a clearer picture by reviewing just one phase of recreation development through the use of some figures of record for hunting and fishing income, no small part of which is the direct result of the state's forest land use program. (Table 2.)

TABLE 2

GROWTH OF HUNTING AND FISHING LICENSES

Year	Hunting licenses Income
1915	$ 238,790.00
1916	269,690.00
1917	289,514.50
1918	284,704.50
1919	372,744.00
1920	504,434.50
1921	432,900.00
1922	446,606.50
1923	605,627.90
1924	613,339.30
1925	646,467.25
1926	649,021.60
1927	1,023,918.80
1928	970,326.80
1929	1,029,629.20
1930	1,095,025.30
1931	1,220,128.05

	Fishing licenses
1929	263,633.00
1930	264,589.00
1931	269,000.00

At the prevailing rate of reforestation in Pennsylvania and in this country, with the planting of less than 100,000 acres annually, it will require 1,000 years to complete the task of reforesting the idle lands in the United States, without providing for current accumulation. In Pennsylvania we have upwards of 4,000,000 acres that are now practically idle. Of this vast acreage, more than 2,000,000 acres are idle farm land, which constitutes an enormous problem because it comprises about one-seventh of the entire area of the state.

There has been a reduction of 51,829 farms in Pennsylvania since 1900. This reduction has been brought about largely by the occupation of urban centers and the abandonment of sub-marginal farm land. We may better understand the magnitude of the abandoned farm problem when we realize that the drop in the number of farms in Pennsylvania during the past thirty years has been approximately 23 per cent. What is true in Pennsylvania is more or less applicable throughout many of the states.

Though it will be many years before Pennsylvania will have its state forests on a self-supporting basis, such a goal is most reasonable. In the meantime, the social service of forestry warrants the state's taking over for forestry purposes the forest land that private capital cannot see its way clear to finance to a self-supporting forest cover. This applies also to the idle unproductive agricultural lands so located as to make state administration practical and which private owners and local governments cannot or will not reforest.

The question of national, state, or local government or private responsibility for

reforestation is largely a matter of expediency. Local government and private ownership, in my judgment, will not solve the perplexing forest land use problem. It is a duty for the state first and then the national government to step in as rapidly as private forest land ownership fails to produce profitable wood crops. Under proper forest management an abundance of game, fish, healthful recreation and profitable woodworking industries will be the result.

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"The human understanding when it has once adopted an opinion (either as being the received opinion or as being agreeable to itself) draws all things else to support and agree with it. And though there be greater number and weight of instances to be found on the other side, yet these it either neglects and despises or else by some distinction sets aside and rejects: in order that by this great and pernicious predetermination the authority of its former conclusion may remain inviolate."

"The human understanding is moved by those things most which strike and enter the mind simultaneously and suddenly and so fill the imagination and then it feigns and supposes all other things to be somehow, though it cannot see how, similar to those few things by which it is surrounded. But for that going to and fro to remote and heterogeneous instances by which axioms are tried as in the fire, the intellect is altogether slow and unfit, unless it be forced thereto by severe laws and overruling authority."

From Francis Bacon's *Novum Organum*, XLVI, XLVII.

GAME AND FORESTS[1]

By PAUL G. REDINGTON

Chief, U. S. Biological Survey, Washington, D. C.

Economically and æsthetically the value of the forest is enhanced by the presence of mammals and birds. Our wild life is worth over one billion dollars to the country. Such a valuable resource should be conserved. The author cites what is needed to manage it wisely—research by an adequate force of trained biologists, refuges managed by competent protectors, a well worked out game management plan, a continuity of state game policies and their administration by interested non-political commissioners; coördination of game organizations; and forest and brush fire prevention. Intelligent game management is hampered by limited scientific information and paucity of research funds.

THE forest areas of our country provide food, shelter, and breeding places for many species of game birds and animals, as well as natural habitat for song and insectivorous birds. A forest without such inhabitants would indeed be a dreary place. It would have little appeal to that legion of men and women and children who delight in seeing and photographing bird and animal life in their natural environments. There is a genuine interest in observing the antics and listening to the calls of animals large and small, from the moose and the elk and the bear down to the tiny chipmunk and the chattering squirrel. One always remembers the swift passage of the startled deer that bucked down the hill to sanctuary, and never forgets the time he first heard the bugling of the great bull elk.

Not æsthetically alone, but economically as well, the value of the forest is greatly enhanced by the presence of the mammal and bird life within its confines. From the forest, in the early days of settlement of this country, came, at least in many instances, needed food and clothing for those doughty souls who pioneered North America. From the bounteous stock of deer, elk, turkeys, partridges, and fur-bearing animals they took what they needed, and made life safer by controlling the cougar, the wolf, the coyote, the bobcat, and other animals of predatory nature.

The natural conditions were undoubtedly disturbed by the white man's advent. From many forest areas of our fair land the original fauna has been heavily depleted in numbers, or is no longer to be seen. Fires have ruthlessly destroyed the habitats of forest birds and mammals, and in many parts of the continental United States an uncounted toll of annual death is taken as the holocausts continue to run rampant.

Man has done much in recent times to bring back, in part at least, game animals and birds to areas from which they had vanished. A study will show that despite the difficulties faced by the elk and other large game animals, their future looks brighter as the years go by. The three species of deer—the Columbia blacktail, the Rocky Mountain or mule, and the whitetail—while varying in abundance according to their regional habitat, may be said to be holding their own.

In some instances where animals of this kind have been given sanctuary, and where their natural enemies have been controlled, great increases in numbers have resulted. These have made certain situations unwieldy, and in some cases have led to such heavy overgrazing as to en-

[1]Presented at the 32nd annual meeting of the Society of American Foresters at San Francisco, Calif., December 14-16, 1932.

danger the very life of whole herds. Oftentimes heavy grazing by domestic live stock—cattle, sheep and goats—within the forests has been a factor leading to the reduction of the game-animal population.

The antelope, once a plains-ranging animal, but now forced to some extent to change its habitat because of the unsatisfactory forage conditions on the open public domain, has repaired to many park areas in the forest. A typical example of this is found in northern Arizona, in the Anderson Mesa country of the Coconino National Forest.

The coyote, likewise, originally keeping close to the treeless open public domain in search of food, has enlarged its roving propensities to such an extent that it is to be seen and heard in heavily timbered areas and on the high open country of our great mountain ranges.

The very great value of wild life to the country can not be fully appreciated by any of us without statements in dollars and cents. Such values are difficult to arrive at, and must for the most part be based on estimates. For some factors, however, the figures are definite, as, for instance, the money returns to the states from hunting and fishing licenses. Probably the most satisfactory estimate for other factors is on the acreage basis, the value being the product of acreage and known facts per acre. In arid and humid regions the basis would differ and the multiplier has to take this into consideration. In the U. S. Biological Survey, Mr. W. L. McAtee, in studies of the economic relations of wild life, has assembled and tabulated data which it is believed are as accurate as it is possible to be for practical comparative purposes. He has summarized the positive values of wild life as follows: meat and fur value of game and other animals, $190,000,000; usefulness of insectivorous birds, $404,500,000; fishes as food, $14,000,000; hunters' license fees, $9,500,000; hunters' expenditures, $158,500,000; tourists' expenditures, based on the proportion attributable to wild-life attractions, $254,500,000; estimated annual total, $1,031,000,000.

For all practical purposes, therefore, our wild life resources may be considered as worth more than one billion dollars annually to the United States. That such a resource shoud be conserved and used without wastefulness requires no demonstration.

Importance of Research

Funds for needed research on game matters are difficult to obtain. This statement applies both to the federal government and to the states. California has trained research men to aid its game commission, and other states employ qualified men in this line of work. But much effort will be needed adequately to bolster up the research activities, and certainly the Society of American Foresters should take a prominent part in such a move. This particular phase can not be emphasized too greatly.

Under the McSweeney-McNary Act for forest research, authorization is given to the U. S. Biological Survey to study the relationships of animal life to forested areas. Full coöperation is had with the U. S. Forest Service, but finances are by no means ample to place a qualified biologist in every one of the forest regions of the country. As a matter of fact, the Survey is able to keep only four men in this field. As times become better, it is hoped to increase this force.

An outstanding accomplishment in this program is to be found in Jackson Hole, Wyo., where one of our biologists for five years has literally lived most of his time with that band of elk known as the Southern Yellowstone herd. Intensive studies have been made of the food habits of these animals, their diseases, their breeding habits, and their relation to domestic stock. The final report on this project

will be in our hands at an early date, though publication may be delayed, since the funds of the Department of Agriculture for printing are not so ample as they once were.

Relating directly to the national forests and bearing on their future, particularly on cut-over areas of ponderosa pine, the habits of the porcupine in relation to forest growth and perpetuation have been intensively studied. The findings indicate strongly—in Arizona, California, Oregon, and other regions where the ponderosa pine occurs—that the porcupine is a menace particularly to such trees as are left on lumbered areas for second-crop production. Control measures have been initiated on several of the national forests, but destruction of seedlings and of the dominant trees of second growth is proceeding apace. Such damage will not subside until sufficient funds are appropriated to make adequate control possible.

In Minnesota and other northern states it has been found that the varying hare, or snowshoe rabbit, is destructive to natural-growth seedlings as well as to those on plantations. Seed spotting in many forests has resulted in failure, because of the activity of these rodents.

I have cited these cases as examples of the relationship of wild life to the forests. Many more of course could be given. To succeed in this forest-fauna investigative work there must be an ample force of qualified biologists, and by the same token the appropriations must be large enough to keep such men at work. There has been a tendency, certainly since 1929, for federal and state law-makers to cut research appropriations heavily. It is exceedingly difficult to convince the majority of those who handle appropriations that without reasonably ample research funds we are minus the groundwork necessary for the solution of problems that are still very baffling.

I might mention that in California, under the auspices of the State Chamber of Commerce, a representative committtee of persons deeply intersted in game matters has been established under the chairmanship of Dean Hoover of Stanford University. The findings have savored of a constructive nature and are of considerable help not only to the state but to coöperating federal agencies. I wish we could record the establishment of like committees in other states.

Refuges for Wild Life

Many states have established refuges for the benefit of the forest wild life, and many of these are located on the national forests, both west and east. The Forest Service in general coöperates with the states in this program, many of the forest officers holding deputy state game warden commissions. Miscellaneous Publication No. 51 of the U. S. Department of Agriculture gives in detail the system of national wild-life reservations administered, as of 1930, by the Biological Survey and by the Forest Service of the Department of Agriculture, and by the Departments of Commerce, Interior, Navy and War. A supplementary list of additions to the federal refuges, since the date of publication, mostly newly created refuges, for waterfowl, is available in mimeographed form.

In the establishment of refuges, one requisite must be kept in mind, namely, that a refuge will be of no avail unless actually supervised by competent protectors. In some states, funds have not been available for the administration of the refuges that have been set aside, and under such status the game animals and birds for which the areas were reserved receive little if any protection.

In considering the many problems of game conservation and utilization one must never forget that the farmer, with his woodlots and hedgerows, has a decided interest in the whole matter of game protection and propagation. Many instances may be mentioned where the

farmer receives a benefit from the presence of game mammals and birds on his property. It is estimated by Herbert L. Stoddard, an expert on quail, that in the South, if given proper protection from natural enemies and provided with proper cover and abundance of natural food, these birds will prove to be an asset to the landowner, who in many cases can lease the shooting privileges to sportsmen. Stoddard has estimated that in such an arrangement, under favorable conditions, a farmer's returns might be as high as fifteen cents an acre. This would apply also where rabbits, pheasants, Hungarian partridges, grouse, and other upland game mammals and birds are present.

For further consideration of the farmer-sportsman relationship, I can not do better than to refer you to the aforementioned report on the American Game Policy—the last paragraph of page 12; page 13; and the first three paragraphs of page 14.

The Game Administrator

We now come to the matter of forest game management. This activity is hampered by our having little to guide us in the way of established facts. Here again the paucity of research funds retards the work of administrators who are anxious to engage in growing numbers of projects of this kind, but are prevented through lack of the basic information that is obtainable only by research.

No one will disagree, I believe, when I state that our beneficial game animals and birds can not continue to be produced and protected in satisfactory numbers by legislative act alone. I have made the assertion many times that political dictation in the matter of game laws and seasons spells no good to the future of those creatures that nature lovers and sportsmen alike believe should survive in reasonable numbers.

There is an increasing move in several states of the Union, irrespective of political views, to select for service in the game commissions men who are familiar with the needs of the beneficial forms of wild life. Along with this has come the movement to stagger the terms of commissioners, so that there will be a continuity of policy in game management over a period of years. Generally the commissioners receive no pay, but are entitled to travelling expenses. Where this method is in vogue, the commission usually appoints an executive officer to carry on its work. In some states the employees of the commissions are under classified civil service.

According to our information we find that 30 of the state game commissioners or commissions have had vested in them plenary powers to open and close seasons, to adjust bag limits, and do other things needed for the welfare of the animals and birds affected. A list of these states follows: Arizona, Colorado, Florida, Idaho, Indiana, Iowa, Kansas, Maine, Massachusetts, Michigan, Mississippi, Montana, Nevada, New Hampshire, New Mexico, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, South Carolina, South Dakota, Utah, Virginia, Washington, West Virginia, Wisconsin, and Wyoming. Three states—Nebraska, Minnesota, and Arkansas — are vested with such power, but to a limited extent. The remaining states (15 in number) have not been granted any such power.

Most of the members of the Society of American Foresters I believe are aware that Congress has delegated wide discretionary powers to the Secretary of Agriculture in the handling of the multifarious projects of that Department. For instance in the administration of the Migratory Bird Treaty Act (for the protection of migratory birds) the Secretary considers the recommendations for regulations designed to give better protection to the ducks and geese and other water birds.

If he is satisfied with these regulations, he adopts them and the President promulgates an executive order to put them into effect. This is true also as to the regulatory work of the Forest Service and many other bureaus. Under such a system, emergency situations can be handled most expeditiously. I suggest in this connection that the decision of the federal court in the Kaibab deer herd matter be considered by a game committee of the Society. This decision is important in that it gives authority to control an existent menace to the forest.

One of the principal functions of the game administrator should be to make a careful survey of the environmental conditions on game areas. It has been shown by many investigators that there has been a lack of attention to the all-important feature of environment, both as to food and cover. This project by all means should be given prominence in any game-management program, and its importance stressed.

There is before the present Congress a bill introduced by Senator Robinson, of Arkansas, on December 19, 1931 (S. 2326), "To establish fish and game sanctuaries in the national forests." The text of the bill deserves your consideration, and is as follows:

"*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled*, That for the purpose of providing breeding places for game animals and fish on lands and waters in the national forests not chiefly suitable for agriculture, the President of the United States is hereby authorized, upon recommendation of the Secretary of Agriculture and the Secretary of Commerce and with the approval of the State legislatures of the respective States in which said national forests are situated, to establish by public proclamation certain specified and limited areas within said forests as fish and game sanctuaries or refuges which shall be devoted to the increase of game animals and fish of all kinds naturally adapted thereto, but it is not intended that the lands included in such fish and game sanctuaries or refuges shall cease to be parts of the national forests wherein they are located, and the establishment of such fish and game sanctuaries or refuges shall not prevent the Secretary of Agriculture from permitting other uses of the national forests under and in conformity with the laws and rules and regulations applicable thereto so far as such uses may be consistent with the purposes for which such fish and game sanctuaries or refuges are authorized to be established.

"Sec. 2. That when such fish and game sanctuaries or refuges have been established as provided in section 1 of this Act, hunting, pursuing, poisoning, angling for, killing, or capturing by trapping, netting, or any other means or attempting to hunt, pursue, angle for, kill, or capture any wild animals or fish for any purpose whatever upon the lands of the United States within the limits of said fish and game sanctuaries or refuges shall be unlawful except as hereinafter provided, and any person violating any provision of this Act or any of the rules and regulations made under the provisions of this Act shall be deemed guilty of a misdemeanor and shall upon conviction in any United States court be fined in a sum of not exceeding $100 or imprisonment not exceeding six months, or both.

"Sec. 3. That the Secretaries of Agriculture and Commerce shall execute the provisions of this Act, and they are hereby jointly authorized to make all needful rules and regulations for the administration of such fish and game sanctuaries or refuges in accordance with the purposes of this Act, including regulations not in contravention of State laws for hunting, capturing, or killing predatory animals, such as wolves, coyotes, foxes, pumas, and other species destructive to livestock or wild life or agriculture within the limits of said fish and game sanctuaries or refuges: *Provided*, That the present jurisdiction of the States shall not be altered or changed without the legislative approval of such States."

In reporting on this bill, the Senate Special Committee on Wild Life Resources gave the measure its unanimous approval. It pointed out that under such an act the national government could without additional expense aid the general public in conserving our wild-life resources, a "movement that now finds approval from all classes of our people."

Assuming the establishment of a refuge with adequacy of protection, a well worked-out game management plan is vitally necessary to deal with the many problems that confront the game protector. One has only to study the Pennsylvania refuge plan to ascertain how much genuine progress can be made in establishing and maintaining inviolate sanctuaries for many species of game birds and mammals. Areas are provided outside these refuges where, under regulation and the laws of the state, sportsmen may bag their game. By citing only one instance it is not intended to indicate that many other states are not doing all they can to establish programs of the kind referred to.

Oftentimes, in the West particularly, the protected animals increase beyond the feeding capacity of the refuge areas. An overflow results, and in many instances crops on farms adjacent to the refuge have suffered considerable damage from their depredations. Damages have often been paid by the state commission to injured persons.

The Management of Game

I recommend that the members of the Society of American Foresters acquaint themselves with the *Report on an American Game Policy*, adopted two years ago (1930) at the National Game Conference in New York. A member of this Society, Aldo Leopold, was chairman of a special committee appointed by the conference, and on it there were two other foresters. It would be a duplication of effort for me to rehearse in detail the recommendations of the committee, which were endorsed by the conference. I urge that the report be studied carefully by any committee charged with the working up of a Society game program. Copies may be obtained from the American Game Association, Investment Building, Washington, D. C. I also suggest that articles on "Game" already published in the Journal of Forestry be considered by any committee designated to report on this topic.

In many cases the game administrator of the present day must proceed too much by intuition derived from his own knowledge of the general habits of the fauna of his region. The degree to which he may be successful depends on *how much* he knows of the habits and characteristics of the fauna. The more he knows the more clearly will he chart his course in his plan of management. Often he is handicapped by the political fiats of the game-minded politicians of his state or county, and probably as often he finds his way blocked or his plans mangled by the inability of the conservationists of the region to agree on clearly defined objectives.

There are many foresters who will wholeheartedly agree with me that there are too many uncoördinated game organizations in the field—all zealous to do something but unwilling to coöperate each with the other. "A little knowledge is a dangerous thing," in game as in other matters. The work of the game administrator of today is interfered with by a babel of suggestions from a multitude of people, well-inclined, but neither possessing nor trying to obtain the factual knowledge necessary to support their many contentions. Moreover, we must assume that situations of this kind will not readily or quickly disappear, and that the best way out is through education, with the game administrator, along with his other duties, assuming the position of teacher.

More and more must the forester and the forest game administrator keep closely

in touch with the fire situation throughout the length and breadth of our forested land. In the files of the Biological Survey, and I judge in those of the Forest Service and many state game commissions, there is ample photographic and other evidence of the toll that fire imposes on defenseless birds and animals in their arboreal environment. I have seen photographs of the kill of deer by fire in the great holocaust that hit the Santa Barbara National Forest in 1932. Uncounted numbers of birds and smaller mammals must always be trapped in such fires.

The game administrator has a large part to play in helping to alleviate the destructiveness of fire to the forest fauna. He should work shoulder to shoulder with the foresters and take part in campaigns designed to educate those as yet unfamiliar with what the fire bill amounts to, not only in timber and cover but in denizens of the forest.

The forthcoming report being prepared by the Forest Service on the Copeland Resolution, inquiring into forest conditions, will be of special interest to all considering the forest-fauna problems. The Biological Survey is coöperating to the extent of its ability with the Forest Service in the preparation of the forest game chapter.

Recapitulation

Forest areas provide food, shelter, and breeding places for game animals and birds, and forest values are enhanced by the presence of wild life.

Man has disturbed natural conditions but to some degree has taken steps to correct the wrong done.

The forest has in part become the home of many animals that formerly were chiefly plains ranging.

Our wild-life resources are worth more than a billion dollars annually and should be conserved and used without waste.

The Society of American Foresters can take a prominent part in bolstering up research work and encouraging the provision of the necessary funds.

State and federal governments have established game preserves and bird refuges, many being within national forest boundaries; all such refuges, to accomplish their purposes, must be adequately supervised.

Game-management plans on refuges are plainly called for, in order that a surplus may be insured and that this may be wisely utilized.

Game on private property is a distinct asset to the landowner; it deserves protection from natural enemies, and the farmer-sportsman relationship must be recognized and the mutual rights and interests respected.

Game restoration requires more than political dictation, enactment of laws, and adoption of regulations; forest-game management is hampered by limited scientific information and paucity of research funds. Studies of environmental conditions are all important.

There is a salutary movement to have game administrators selected on merit and ability, and not because of political affiliation, to insure a continuity of policy in game management.

The court decision on the Kaibab deer herd is of importance to forest conservation and deserves careful study by a game committee of the Society.

The destructiveness of fire both to the forest and to denizens of the forest is an ever-present problem, and effective combat demands the fullest coöperation between the forester and the game administrator.

COMMENTS[1]

By JOSEPH DIXON

Wild Life Survey, National Park Service

THE value of fish and game and recreation, as a source of income, is becoming more appreciated by land managers. Recently in talking with one of the Regional Foresters he said "I am afraid that in the immediate future the cash income from timber cut is liable to be greatly diminished." Looking for some means to carry on he had concluded that there was very good opportunity indirectly to help the slump in question through the development of fishing, hunting and recreation. As he pointed out, the return to supply human needs is just as true forestry if measured in human wants as if measured by a ten dollar bill. I believe the development of these resources is truly forestry. As we find we have more leisure, more people don't know what to do with it. For that reason I think it important that we develop more of our natural resources such as fishing and hunting, and the recreational development that comes with it.

From several speakers we have heard today about the substitution of yield tax for annual timber tax. I would like to suggest that there may be application here in some places for fish and game or recreational return which may in part at least fill a long desired want there. If we can provide the fish and the game for fishing and hunting, that is going to do something toward giving annual return which might make it possible to carry a forest property until the timber can be harvested. And it is something that can itself be established on a sustained yield basis. I think that it is a very important point in our forestry program that there is developing, and will develop, especially under present conditions, a greater tendency to give heed and thought to practice in that phase of forest production. To illustrate the progress that has developed along such lines. Some eight years ago, when recreation development had already begun in many places, I was in one of the national forests in California. It was in an area where commercial value of timber was not very high, and its value from the lumberman's standpoint was very low. But the ranger did not think that recreation or sport offered much in possibilities for forest revenue there. Two years ago I went again to the same territory with the same man and he explained and apologized for how far behind in that development they were. Today I have the word of the gentleman in question that, through the leasing of summer home sites, that area formerly considered of minor value is today giving a return in the form of annual cash money for leases which will compare very favorably with timber returns from the best of western yellow pine or sugar pine forest. My plea today is that there are other values in the forests besides some of those we have been prone to look at. I prophesy that in the next few years we will see more importance attached to what have been considered secondary sources of income.

One word in closing. As one who has had the problem of finding ways and means by which the wild life in national

[1]Presented at the 32nd annual meeting of the Society of American Foresters at San Francisco, Calif., December 14-16, 1932.

parks may be preserved, I have constantly been facing the fact that in many cases we do not have basic information which is necessary. I have come to believe that our control and administration of wild life is no better than our knowledge of the fundamental and basic requirements of our animal wild life. We still know much less about it than you foresters know about the requirements of the forests which you are handling, such as soil requirements, tree requirements. Therefore I strongly commend you that effort be made for increased research to secure the necessary information for a satisfactory program of wild life management.

The New Jersey Conservation Department's foresters are continuing work with the Trenton Emergency Relief Committee on Unemployment. Woodlots in the vicinity of Trenton are examined and recommendations made for cutting. Sometimes the tracts are cut clean, sometimes thinnings are made, the foresters marking the trees to be removed. Up to date, something over one thousand cords have been cut. This wood is sawed up into stove lengths and distributed free to needy families.

From *New Jersey Forestry News*, July-Sept., 1932.

AMERICAN FOREST POLICY[1]

By EDWARD C. M. RICHARDS

Consulting and Operating Forester, West Chester, Pa.

FIRST a few definitions: *Forestry.*—The farming of forest soils on a permanent, sustained yield basis for the production of timber. *Free Private Forestry.*—The practice of forestry on lands not publicly owned, such practice being entirely free from public restrictions, both legal and socially implied.

America has no adequate national forest policy. The present economic depression amply shows this. With millions of men unemployed and tens of millions of acres of lands, primarily best suited for growing forests, abandoned for taxes and lying idle and uncared for, a reasonable forest policy for the Nation would put these idle men to work organizing such lands into public forests. With this in mind, let us glance at some recent forest history, with the purpose of understanding better how this history has contributed to the present situation.

Go back a few years to 1918. When Dean H. S. Graves returned from France after the War, he made an address in which he said that the time had come for the United States to stop forest devastation, and he added that this should be done even if it might require the use of "mandatory" legislation in order to do it. This raised much talk which finally resulted in the introduction of the Capper Bill as a means of bringing forest devastation to an end although the Capper Bill itself did not win the approval of Dean Graves. The most striking thing which came from this move was the fact that for the first time the lumbermen suddenly woke up in real earnest and began to take an interest in the forest problem of the country. Evidently, the introduction of a federal bill, with teeth in it, designed to establish some kind of control over the conduct of woods operations frightened them. With the striking ability of such men of action as they are, they got behind the Snell Bill as a means of preventing the passage of the Capper Bill. Of course, the terms of the Snell Bill were carefully arranged so as to be quite innocuous, as far as insisting that anything really be done in the direction of regulating what the private owner is permitted to do in the woods. It was quite evident that the organized lumbermen were on the job and did not intend to let any entering wedge of regulation of woods operations get started if they could help it.

But the organized lumbermen were aroused. A concerted drive had been directed against their right to do what they wanted with their forests when they wanted to do it, and naturally they were not going to allow the matter to drop with the mere defeat of the Capper Bill. And I cannot blame them for their attitude. They have merely been following out the fundamental ideas of capitalism as developed here in America—namely the trying to make as much money out of a given natural resource as they could, in the same way as the oil men, the coal men, and all other business groups active in exploiting a natural resource have been trying to do. If, in the process the forests were being devastated, that was not nice, but it was quite in line with the working of private capitalism in oil, coal

[1]Presented at the 32nd annual meeting of the Society of American Foresters at San Francisco, Calif., December 14-16, 1932.

NOTE: This article is based on 15 months observations of European forestry.

and very often in agriculture as well. The lumbermen have a real argument here, and I do not think it fair to adopt the attitude of blaming them for being the wicked destroyers of our country. They are that, all right, but no more so than many other business men in other lines. So why pick on them? The real seat of the trouble lies in the system of private profit as applied to a natural resource and not in the man operating under that system.

Following the Snell-Capper Bill controversy, the organized lumbermen started right in to insure their business against any further interference from the conservationists. In a number of organizations in Washington, highly paid, efficient, and astute, key men were placed whose job it has been to keep the forests safe for the present set-up of the lumber and allied businesses. These men were supplied with ample funds, they were carefully chosen and they went to work with a will. And here is where we foresters can learn something. Remember that the Snell-Capper Bill controversy ended in a deadlock on the main issue—the regulation of cutting on private lands. All subsequent legislation has not tackled this point but has merely gone ahead on other issues. The Snell Bill, it will be recalled, advocated so-called "coöperation" in the conduct of woods operations. It put the matter in such a way that one might think that the private owner would "coöperate with public bodies in this work." Here was a good "line," and the highly paid key men recognized its value and have played it up strongly ever since. In their propaganda, "coöperation" holds a high place. In fact, it is extremely "high and lifted up" even "exalted," and with splendid results as far as stalling off any effective legislation dealing with regulation of cutting on private lands is concerned. They have surely made "coöperation" a big asset to the interests of their employers, so that today some ten or more years afterwards the private forests continue to be destroyed.

The latest authoritative source of information dealing with the whole present situation of the forests of the United States is the Special Report to the Timber Conservation Board issued under the date of January 30, 1932, by the Forest Service. From this publication, the following facts and figures are worthy of note.

From Table 15 the losses of the forests of the United States per year from all sources are estimated as follows:

	Cubic feet
Losses due to cutting timber	14,495,308,000
Losses due to fire	870,690,000
Losses due to other causes	940,209,000
Total annual losses	16,306,207,000

From Table 32 the estimated total annual growth including both sawtimber and cordwood comes to only 7,040,000,000 cubic feet.

From this it is evident that in spite of all the money, time, effort, propaganda for conservation, and education of public opinion during the past decade or more, we are still destroying our supply of timber and cordwood twice as fast as it is being regrown. Also, it is worthy of note that the vast bulk of losses are in the form of what is cut by the lumbermen, who are spending money to keep lobbyists in Washington to prevent anything being done to stop this enormous loss.

On pages 20 and 21, of the Special Report, the losses from fire are dealt with. Here we learn that the protected areas, as of 1930 figures, over the country totaled some 227 million acres and that the public lands which have been organized under some form of permanent management, such as the national and state forests, the county and municipal forests, the national and state parks and the forests on the Indian Reservations are being protected with some effectiveness. But there are

some 190 million acres of forest land in the United States, most of which is in private ownership, which are not protected from fire at all. Each year some 129,000 forest fires sweep our forests burning over about 45 million acres of land or about 9 per cent of the total forest area of the country.

Now the lesson that we foresters can learn from all of this is that we have been simple and guileless and childlike. Today we are just where we were ten years ago on the real issue of control over woods operations. Here and there one can find a law calling for leaving a few seed trees or some such detail, but in 1932 we foresters need to realize and to admit to ourselves that the key men and their backers have "held the line" practically 100 per cent to date. The vitally important thing is for us foresters to wake up to the fact that we have been barking up the wrong tree all of this time, thinking that "coöperation" was our coon. But let us examine it in what it means here in America. Then let us turn our gaze to those parts of Europe where real forestry is being practiced successfully and see if we can locate any nice coöperation coons of the same stripe "sitting pretty" in any of the trees there.

"Coöperation" here has meant that the public authorities and the private owners are to work together in harmony. The owner is to remain the owner in fee of the land and timber and as long as he does not menace the forests of his neighbors, he remains the absolute lord and sovereign of his own domain. He does not have to cut any of it, nor does he have to maintain any or all of it in forest. And the public authorities must stand off and let him alone in all of this. They will coöperate with him in a number of things, if he wants to coöperate. And various schemes have been tried out to get him to do so—special tax laws; cheap nursery stock; free technical advice; financial assistance in fire protection. These are all to the good. But when it comes right down to brass tacks, "coöperation" leaves the owner absolutely free to manage his timber in any way that he sees fit. In other words, "coöperation," in our meaning of the word, rests upon the fundamental faith that *free private forestry is a possibility*. Is this faith justified from the experience of countries where forestry is now really being practiced? I have recently returned from a visit to the forests of Central Europe and the British Isles, where I had some opportunity to see forestry at its best and to talk with foresters from all over the world. What answer can I give to this question in the light of my experience?

In Switzerland, no private owner whatsoever is permitted to reduce the area of his forest. If he cuts clear—and in the high mountains he cannot do that anyway—he must reforest the area promptly, or in case he wants to clear the land permanently, he must plant up a corresponding area somewhere else on his property. The Swiss Government is firmly determined that the forest area of the country shall not be reduced.

In Germany, timber growing on a sustained yield basis is taken as a matter of course everywhere. Although in Prussia, Silesia and Saxony—which together make up a large part of the country—the private owner is legally free to do what he wishes with his forest, there is no danger of forest devastation on these private areas. Under conditions of prosperity these forests only return between 2 and 3 per cent on the investment, and today they often return no profit at all. In America such a situation would almost surely result in forest destruction, but in Germany public opinion, custom, the great prestige which goes with owning a private forest, taken together hold the owners in check in spite of low financial

return. Like removing one's shoes and stockings in company, forest devastation is not the thing. It just isn't done. Furthermore, even in Germany private forests are unsatisfactory. To quote Dr. Schwappach of Eberswalde, perhaps the dean of all the living German foresters: "It would be better for all concerned if there were no private forests, and the State owned them all."

In England and Scotland, before the Great War, the idea of free private forestry prevailed. When the war came along, the English people found that there had been no such thing as free private forestry in the country, and the country was desperately short of timber, while large areas of land lay idle. Today, the foresters of the British Empire are all "public" forestry men and the great drive is along that line. They have learned their lesson—namely, that if you want forests, the public is the one to see that they are produced and maintained—not private owners.

And so it goes. I did not see a single case of free private forestry, in the American meaning of the term, in all of my more than twenty thousand miles of travel in Europe and when I asked the leading German and other foresters who were in a position to know, about the matter, the answer was that nowhere on the whole earth is there such a thing in existence. Free private forestry? Forestry through free "coöperation?" It just won't work, that's all. And I can readily see why. No private owner is willing voluntarily to tie his capital up tight—solidly frozen—in the necessary growing stock. During this economic depression, when we are all short of money, who would not be tempted to cut into such a stand of accumulated wood capital to raise some needed cash? Or again, windfall. Who wants to tie their money up in a business which may suffer as the forests of the Bomerwald are suffering right now? There, in a region of optimum growth for Norway spruce and conditions which are excellent in other ways, suddenly the foresters' entire working plan is rendered useless by such extensive windfalls that all that can be done is to try to push the logging to the limit in order to salvage what is blown down. And this when the dumping of cheap timber into the German market by Czechoslovakia, Jugoslavia and Russia has reduced prices drastically. Well, do you want to put your money into a venture like that? Will you recommend it to other individuals or corporations? Only permanent public bodies can be expected to handle such a proposition and assume such a risk. Add to this the low interest return on the capital invested in land and growing stock and the whole idea of placing faith on free private forestry as the way out of our forests problem in the United States looks bad. (The state forests of Saxony—where forestry is forestry and no mistake—only pay about 2.5 per cent on the investment, while the highly productive forest of the city of Winterthur only pays around 1 per cent on the total investment.) Altogether the evidence points entirely away from any such things as free private forestry, and the "coöperation" ballyhoo is a good thing for us foresters to forget.

If we turn our backs on "coöperation" and "free private forestry," what alternatives remain? I see two—forestry by public regulation (semi-public forestry) and out and out public forestry. Both methods can succeed, as frequently shown abroad. It is only a choice as to which can fit into our American conditions best.

Semi-public forestry is the imposition by the public of adequate restrictions upon the owner as to what he can do in his forest. Such forestry is reasonably possible where forestry can function as secondary land use (water companies, farm woodlots, etc.), or where an industry requires cellulose, even though grown,

erhaps at a loss. Also in restricted, espe-ally favorable localities (parts of the ash pine belt, for instance), out and out ommercial forestry can be hoped for erhaps. But only as "semi-public," and ot as "free private" forestry is such hope easonable. In each case the question al-ays is, whether the necessary silvicul-ural restrictions can actually be enforced h the woods with any practical amount f effort. In addition, we have here a ell organized, highly paid force of bbyists working hard to prevent any uch restrictive measures from being en-cted in the first place. Furthermore, the rospect of putting the restrictions into ffect over our huge forest area against he deeply seated antagonism of the own-rs may well give us pause.

There remains public forestry. There is othing new about this, but there is this o be said. Looking back at the days of oosevelt and Pinchot and the intensive rive and fiery enthusiasm of the early ears of the century, it seems to me that omething is radically wrong with the resent forestry movement here in the nited States. Where is the ardent zeal, he glowing vision of 1905 and 1910? hat is lacking? I asked a well known orester in state employ if it would not e a good thing to greatly increase the te of land acquisition for state forests that state. He said no, because there as not a large enough force of clerical nd other helpers to keep up with the gal work involved in such an increase! an you beat that? And then there are ose gentlemen among us who oppose e establishment of any national forests some states and even those who op-se state forests, arguing that free pri-te forestry will do it all. Let's look at cts frankly. We know that there is no restry worthy of the name on private nds in the United States unless you unt an infinitely small number of areas where some mild efforts are being made to save young timber for a second cut, to plant a few thousand trees, or to keep fire out. We know that appropriations are entirely too small to adequately manage the national forests, or to properly control forest fires. We know that destructive logging goes right on ruining what is left of our virgin stands more rapidly than ever. As for public acquisition, we have been content with having the federal government buy up about a half million acres a year, while probably three million acres are devastated in the same period.

One of the things which struck me all through my European travels was the fact of the dignified position and evidently powerful influence the foresters held. I recall in Rumania, we stopped over night in a large town and the local foresters gave us a banquet—we were the first American foresters to go there, I understand. At the dinner, the man next to me proved to be the director of a "church" forest which owned practically the entire neighborhood and his job was the management of some hundreds of thousands of acres of highly productive spruce forests. These forests were of course handled on a sustained yield basis with the benefit of the entire community in mind, as a first consideration, and the whole town and the whole region around about all rested on them for its economic life. The forest supplied work to the people; it paid the taxes; built and maintained the roads, the schools, the churches, and in fact, the forest just *was* the whole place. The forest director sitting next to me felt this. He had the poise of a man of great influence in society. To him, forestry was of first importance, and he was accustomed to have the people he dealt with acknowledge it and treat him accordingly. His bearing was that of what one might expect to find here in a combination of the president of the largest bank in a

large city and the most famous surgeon in the state. Yet he was friendly and courteous and helpful to a remarkable degree. But here was a man who believed that forestry "belonged." The contrast of this with our own position here in America struck me strongly, and I think that one cause, if not the chief one, is our own lack of honest faith in forestry. And in our own hearts we know that we cannot have a whole hearted faith in any such flimsy forestry as has been talked about and advocated in the United States. The attempt to argue for and promote forestry as a private business enterprise suitable for individuals or private profit seeking corporations to go into has, it seems to me, been a subtle poison eating at the root of the forestry movement. Forestry as a private business for profit here and now is such a poor bet that those who know most about it—we foresters—carefully do not put our own money into it seriously. Government bonds are safer, will pay as much or more and can be sold at any time. And then, we go out and advocate this kind of thing for others to put their money into, and all we really do is to deceive ourselves—nobody else is fooled by it for a moment. To them, it's just another kind of racket to be politely passed on with a kind word and a straight face. It gets nowhere and will get nowhere. But we foresters are just "undermining our own enthusiasm" as we try to convince ourselves and each other in it all.

Now take the other side, public forestry. Here we have something solid. The public needs forests and will need them. Their value for water conservation, flood control, erosion prevention, and recreational use is worth good hard money to the people, quite regardless of wood production. Every year such values are increasing astonishingly. Furthermore, our efforts along the lines of public forestry, although handicapped in many ways, have been really successful. All the indications are in the direction of public ownership and management of forest land and the public is increasingly admitting that that is the best way to handle forests. The public can afford to hold growing stock as frozen assets, it can afford to take losses from windfall or other damage as no person or profit seeking corporation can, and it can insure continuous management over whole rotations, covering many scores of years. And the public is willing to accept forests in that category—namely, that they are intrinsically so made up that the public should handle them in the public interest—for cash money profits sometimes, but for profits in other forms everywhere and at all times.

Here it is in a nutshell, it seems to me. Public forestry limps along "on one cylinder" through lack of enthusiasm, faith and vision. We foresters have timidly listened to the "rugged individualism" ballyhoo of recent years and have then tried to find a way to succeed in establishing something which has failed everywhere else in the world—free private forestry—although our own good sense and training creates doubts in our minds about it.

We need to remind ourselves again that our highest and most patriotic obligation as technical foresters is to the whole people of our country who need our skilled services in establishing and organizing the huge forest area of the United States on a sensible, permanent basis of forest farming in the interests of the American public. With minor exceptions, taking the country as a whole, this means public forestry. With many millions of acres of lands best suited for forests already in public hands and probably as much more to be had for a song the Society is faced with the gigantic task of getting these areas organized into public forests. On this program we know that we are on safe ground and our faith

n forestry—public forestry—cannot be haken. For the past decade the emphasis as been on private forestry. The time has rrived to change that emphasis and, tarting with tax delinquent and low grade lands which have reverted to public ownership, throw our whole weight as a profession and as individuals behind a great, timely, practical campaign for public forests of all kinds right now.

DISCUSSION

RICHARDS PAPER

Chairman McCarthy: German forests were built up on very low wages, with a market that was undoubtedly in excess of the supply. There is growing stock and the growing stock exists where the market is. We have a growing stock, but it is 2,000 to 3,000 miles from the market. I think Richards is right when he urges the matter of public forestry, but I think that small pieces of private enterprise may yet come out on top.

SHALL WE PROTECT WESTERN WHITE PINE FROM BLISTER RUST?

By PHILIP NEFF

Logging Engineer, U. S. Forest Service, Missoula, Mont.

The blister rust disease threatens to wipe out the 5-needle pines as commercial species. Are they worth the cost of defending them against the disease? The author makes a clear case for western (Idaho) white pine. He finds that its wood has such intrinsic value that in spite of business depressions it commands a good price and has a better market than its associates. Without the white pine many areas of the Inland Empire would not be worth logging and if white pine is not protected to assure its appearance in future stands its place will be taken, not by its nearest market competitor, ponderosa pine, but by the species of much less utility and value such as white fir and hemlock.

THE cost of protection in the white pine type of the Inland Empire has been the highest in the United States. Now comes blister rust and the necessity of controlling it or losing white pine entirely.[1]

It seems certain from experience in the white pine stands of the East that blister rust can be controlled, and several years experience in Ribes eradication in Idaho indicates that eradication will cost from $2 to $2.50 per acre for initial eradication, and a follow-up or yearly maintenance of about 8 cents an acre. But the question is, can white pine in the Inland Empire stand all these costs? Or, putting it another way, are we justified in spending the money necessary to protect it?

The object of this paper is to throw some light on the question from the standpoint of past and present values and costs of production. All values of this sort are matters of comparison. Volumes have been written on white pine, the "king of softwoods," and some historians base a large share of the progress of the Nation on the white pine forests that were available to the settlers and early industries. Now we often hear the argument that the Nation has grown past that stage and that wood is wood, not much is needed, and less will be in demand in the future. This may be true, but, what species and grades or types of wood will be in demand?

Under present conditions, strange as it may seem, the best grades of all species are marketable, while the Number 3, 4 and 5 boards can scarcely be sold at all, and white pine, grade for grade, although higher in price, has been in better demand than ponderosa pine.

What may be termed an intrinsic value comparison may be made on the basis of past and present usage, and the attributed qualities of the tree.

Ponderosa pine is the most important competitor of western white and sugar pine, and is available in large quantity and good sizes. Other important competitors are the southern pines, Douglas fir, and redwood. Cedar, spruce, hemlock and white fir are minor competitors.

The average age of the western white pine now being harvested is about 160 years, and that of ponderosa pine in the Inland Empire is about 250 years. West Coast Douglas fir and redwood trees in competition average 300 or more years old. Cuts per acre in the Inland Empire

[1]The pines mentioned in this paper are eastern (or northern) white pine (*P. strobus*); western (or Idaho) white pine (*P. monticola*); sugar pine (*P. lambertiana*); and ponderosa (formerly western yellow) pine (*P. ponderosa*).—*Ed.*

egion are averaging 18,000 to 20,000 board feet for white pine compared to 0,000 to 12,000 for ponderosa pine. These figures do not include the associate species cut, which bring the cut on white pine areas to an average of over 25,000 board feet and the ponderosa to about 12,000. Defect is a little more for white pine at the present cutting age. Good stands of western white pine have averaged as much as 50,000 board feet per acre for a section, or as much as $150,000 per acre on smaller tracts. We have records of stands averaging 80,000 to 90,000 feet per acre at 100 years. Scott Creek on the Coeur d'Alene National Forest yielded an average of 40,000 per acre at 100 years. A yearly average growth over a period of 100 years of from 400 to 500 feet per acre for white pine is conservative for good white pine sites reasonably well stocked.

Ponderosa pine cannot maintain itself on good white pine sites because it cannot successfully compete with white fir, larch, Douglas fir and hemlock. On the poorer sites, such as southern exposures, where it can compete it will probably produce 150 to 300 feet in comparison.

White fir will probably produce from 80 to 100 per cent as much at 100 years as white pine on the Coeur d'Alene Lake and Clearwater River drainages. Other species generally associated with white pine are slower in growth than either white pine or white fir.

A rotation age of 100 years is practicable for white pine, and the lumber produced from stands of that age is not less valuable per thousand feet, log scale,

TABLE 1

REQUIREMENTS OF WOOD-USING INDUSTRIES—1928

Industry	White pine			Ponderosa pine	
	Position softwood	Million feet	Per cent of total	Rank	Million feet
Boxes and crates	3rd	737	51.7	2nd	951
Sash and door, etc.	4th	300	21.0	2nd	720
Planning mill products	5th	147	10.3	3rd	301
Matches	1st	115	8.1		None
Patterns and flasks	1st	21	1.5	2nd	4
Car construction and repair	2nd	16	1.1	3rd	15
Rollers, shades and map	1st	14	1.0	4th	Less than ½ million
Caskets and coffins	4th	10	0.7	3rd	13
Signs and supplies	2nd	8	0.6	3rd	3
Toys	2nd	7	0.5	3rd	2
Electrical apparatus	3rd	6		2nd	12
Woodenware and novelties	3rd	6			None
Ships and boats	4th	5			Less than ½ million
Musical instruments	2nd	5			Less than ½ million
Laundry appliances	1st	5		2nd	4
Fixtures	4th	4			3½
Furniture	5th	4			4
Motion picture supplies	2nd	2	3.5		
Dairymen supplies	5th	2			
Pumps and wood pipe	2nd	2			
Refrigerators and kitchen cabinets	6th	2			
Trunks and valises	4th	2			
Agricultural implements	3rd	1			
Cigar boxes	2nd	1			Less than ½ million
Instruments, professional and scientific	2nd	1			None
Shuttles, spools and bobbins	1st	1			None
Sporting goods	2nd	1			None
Vehicles, motor	6th	1			
Others		1			
		1,427	100.0		

than that being now manufactured from trees averaging 160 years old. In fact, from a financial standpoint 80-year rotations will probably be much better than those of 100 years.

White pine goes largely into lumber and match blocks, as far as local manufacture is concerned. Its final utilization and the amount of ponderosa pine used for the same purposes is shown in Table 1. Products for which the white pine are chiefly used as compared to ponderosa pine are matches, patterns and flasks, rollers and shades, signs and supplies, toys and other minor items. Total consumption of all species of white pine except sugar pine in 1928 was 1,427 million feet.

A comparison of lumber produced from the western white pine trees now being harvested with that from ponderosa pine trees shows that white pine produces from 22 to 24 per cent more grade No. 2 common and better than does ponderosa pine. This is due to smaller knots and less pitch, stain, and the like in white pine.

Western white pine produces less of the C select grade and more of the better common grades, No. 1 and No. 2, whereas ponderosa pine develops more No. 3 and poorer grades.

Overrun averages 25 per cent for white pine, 16 per cent for ponderosa pine, 20 per cent for white fir and spruce, and 20 to 30 per cent for Douglas fir and larch. Therefore, the comparative spread between selling prices of species or grades on a lumber tally basis which are now referred to are not so favorable to white pine as in actually the case.

Figure 1 shows average selling prices f.o.b. mill for western white pine, southern pine and Coast Douglas fir from 1915 to 1929.

Figure 2 shows average selling prices for all Inland Empire species f.o.b. mill from 1913 to 1931, inclusive. Note the wide spread between western white pine and other species. For the year 1931 western white pine averaged $27.56, ponderosa pine $18.25, Douglas fir and larch $13.58, and white fir $11 per thousand board feet, lumber tally basis.

Figure 3 shows the story of white pine mills dependent on white pine in the Inland Empire based on 1929 data.

Figure 6 shows the logging and milling cost, log scale basis, plus 25 per cent margin for interest, risk, incidentals and profit, and the margin for stumpage for ten companies from 1912 to 1927.

The stumpage realization was from $3 in 1914 up to $18.19 in 1920 and back to $6.80 in 1924, and $8 in 1927. The average stumpage for the 16-year period is $7.70 per thousand board feet. No other species in the region would show half this stumpage value for the same period

Recent costs and values are materially lower. Table 2 shows logging and milling costs, selling value and spread for western white and ponderosa pine on the basis of five-year averages, 1926 to 1930, inclusive. Spread includes stumpage and margin.

TABLE 2

SPREAD BETWEEN COSTS AND VALUES OF WESTERN WHITE PINE AND PONDEROSA PINE

	Western white pine	Ponderosa pine
Cut per acre (average)	25,330 bd. ft.[1]	12,500 bd. ft.[1]
Age (average)	160 years	250 years
Logging cost (log scale)	$15.45	$12.50
Manufacturing cost (log scale)	15.00	12.80
Total production cost (log scale)	30.45	25.30
Average mill-run value (log scale)	43.45	30.60
Spread	13.00	5.30

[1]Includes cut of all species in western white pine type. White pine alone, 17,840 board feet

The species associated with western white pine, commonly called "mixed,

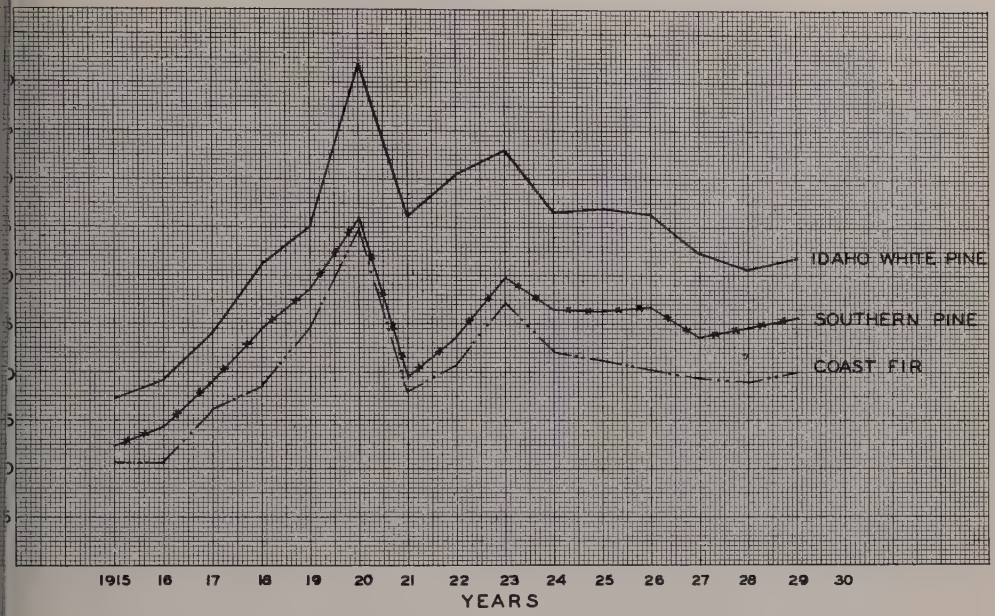

Fig. 1.—Comparative wholesale lumber prices. Average for all grades f. o. b. mill.

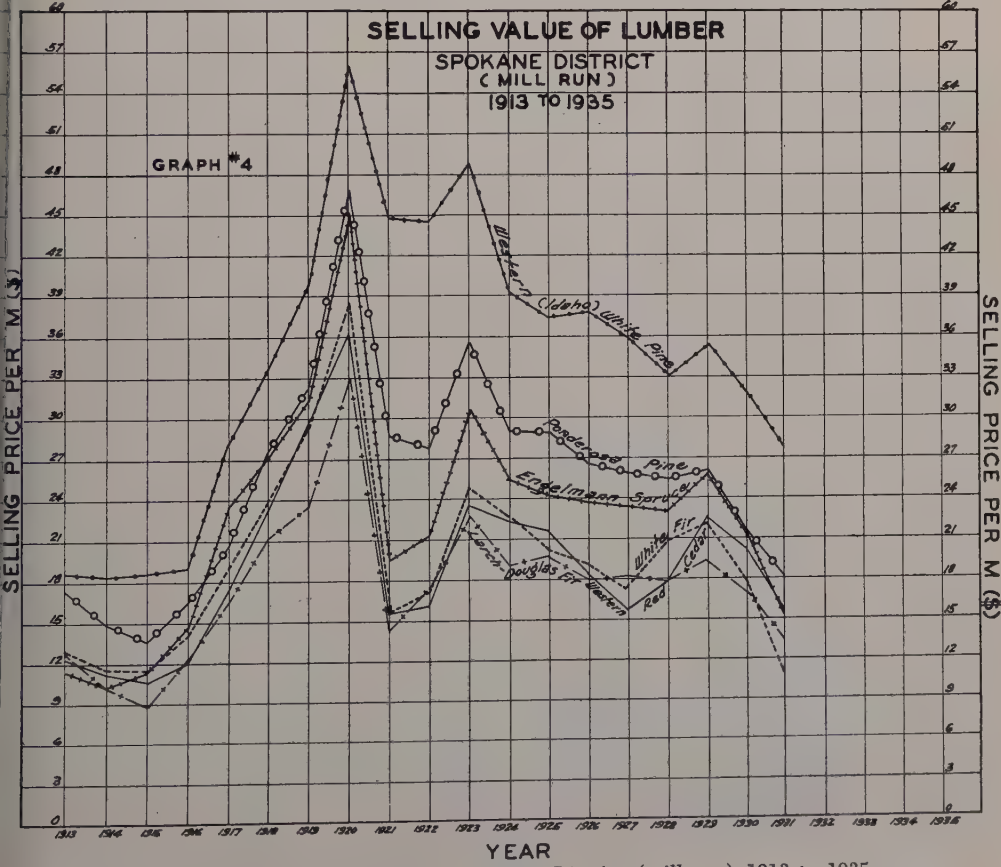

Fig. 2.—Selling value of lumber, Spokane District (mill run) 1913 to 1935.

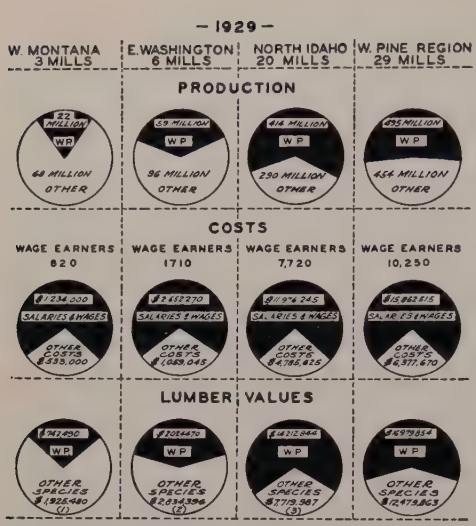

Fig. 3.—The story of white pine mills dependent on white pine.

were generally of no conversion value 20 years ago and are of less value to-day. It is these species and not the more desirable ponderosa pine which will naturally take the place of white pine killed by blister rust.

During 1931 when lumber selling prices f.o.b. mill were lower than at any time since 1917 we find that only two mills cutting principally "mixed species" operated at all, and these mills produced principally ties and timbers.

The reduction in mixed species cut was 65 per cent and for ponderosa pine 60 per cent in 1931 compared to 1930 whereas the reduction in white pine cut was only 23 per cent. One of the largest mills cutting white pine cut 44 per cent of that species in 1930 compared to 89 per cent in 1931 and another large mill 48 per cent compared to 94 per cent.

Figure 7 shows the comparative values, log scale basis, of white pine and its associate species, (white fir, hemlock, larch and Douglas fir), 1913 to 1931 inclusive. The spread was least in 1913, ($8.05), and greatest in 1921 ($38.20) and in 1931 it was $20.41 although the price of mixed was only $14.04.

As to the future and its values and costs, no one knows. Will the value rise or fall in comparison with other species as production decreases and white pine becomes scarce? Table 3 shows the production and value of white pine, 1899 to 1929.

The annual cut (5-year average, 1925-1929) was 1,369,000,000 feet (all white pines). The annual cut of western white

TABLE 3

PRODUCTION AND VALUE OF WHITE PINES

(Not including sugar pine)

Date	Annual cut, million feet	Value per 1,000 board feet	
1899	7,742	$12.66	0.1 per cent comes from Inland Empire
1904	5,333	14.93	
1905	4,868	——	
1906	4,584	18.32	2.5 per cent comes from Inland Empire
1907	4,193	19.41	
1908	3,345	18.17	
1909	3,900	18.16	Production half of what it was in 1899
1910	3,352	18.93	7.4 per cent comes from Inland Empire
1915	2,291	17.87	18 per cent comes from Inland Empire
1918	1,968	30.84	Production half of what it was in 1909
1920	1,377	41.49	25 per cent comes from Inland Empire
1925	1,521	32.58	32 per cent comes from Inland Empire
1928	1,367	28.71	
1929	1,248	——	43 per cent comes from Inland Empire

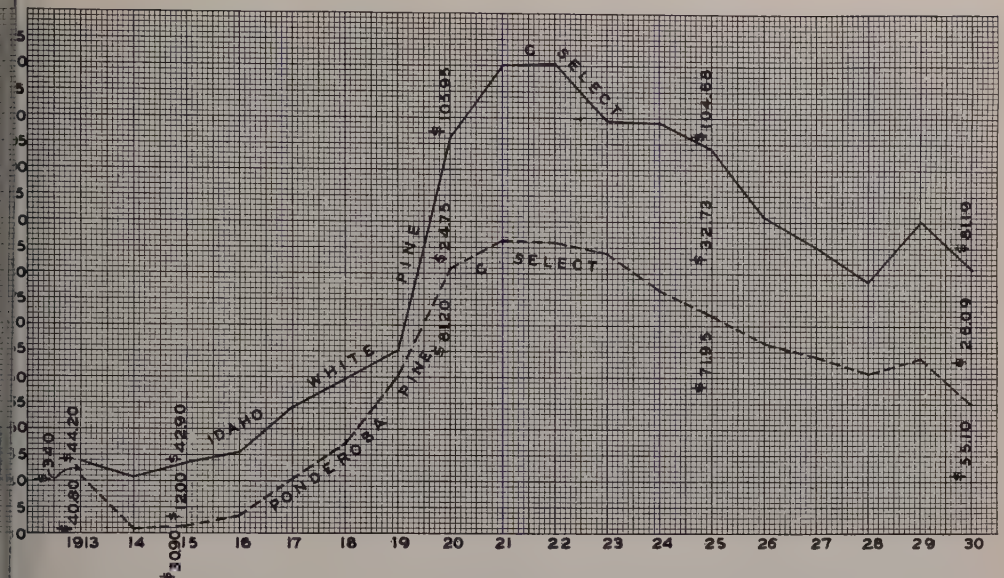

Fig. 4.—Graph showing comparative prices C-Select. Western white pine—2 per cent of production. Ponderosa pine—5 per cent of production.

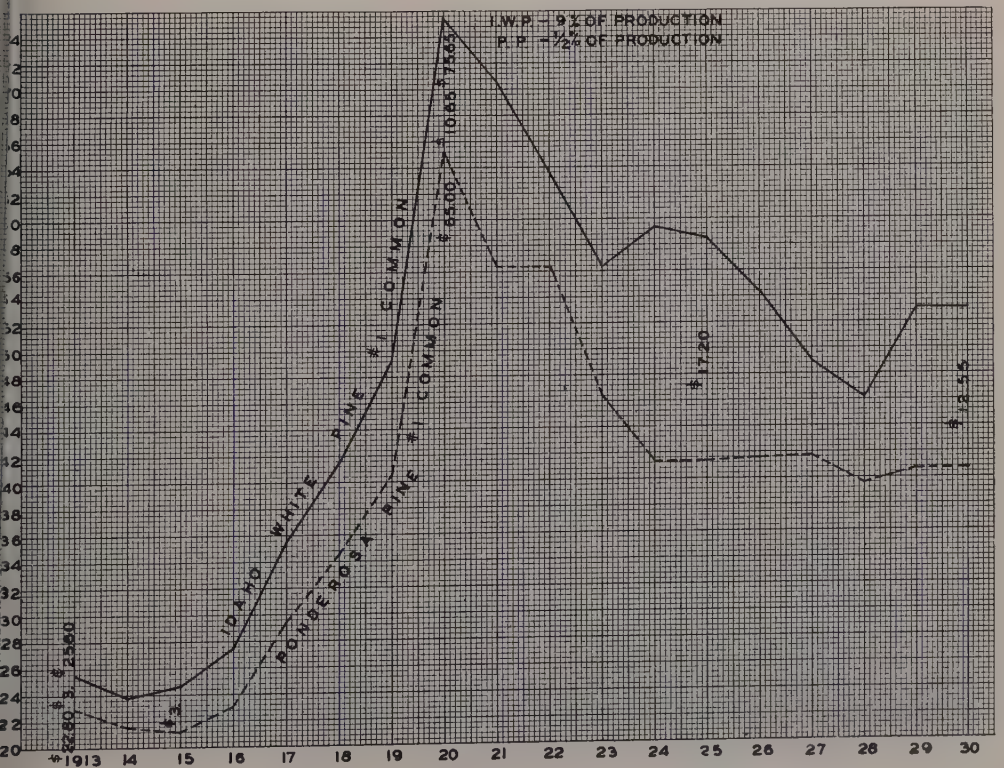

Fig. 5.—Graph showing comparative values No. 1 common.

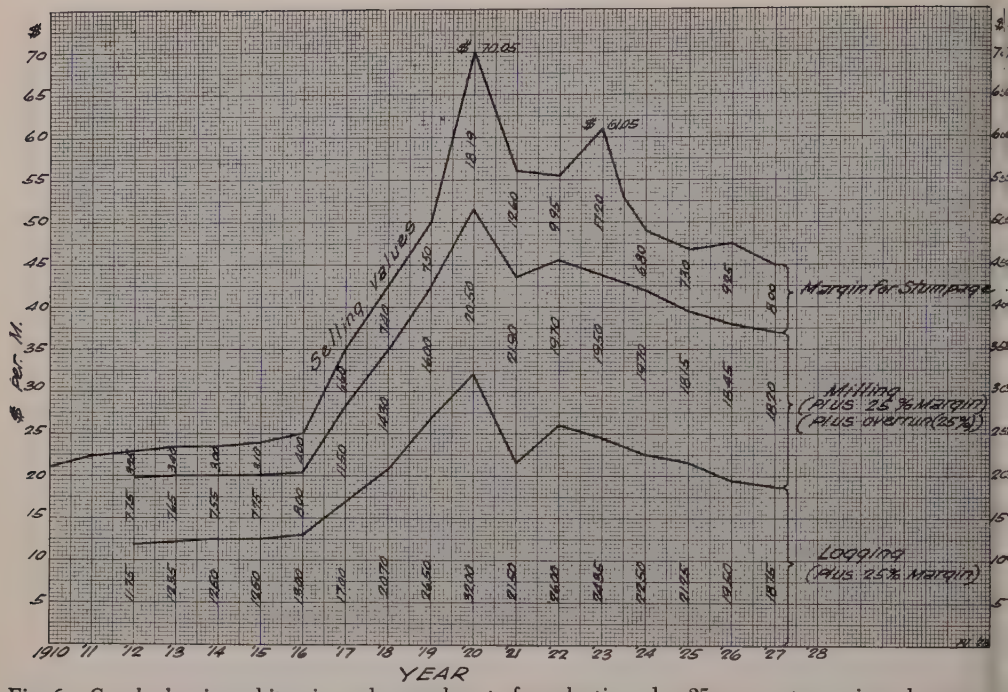

Fig. 6.—Graph showing white pine values and cost of production plus 25 per cent margin—also stumpage margin left. Basis—10 companies operating on private, government and state timber. 1910 to 1927 log scale basis.

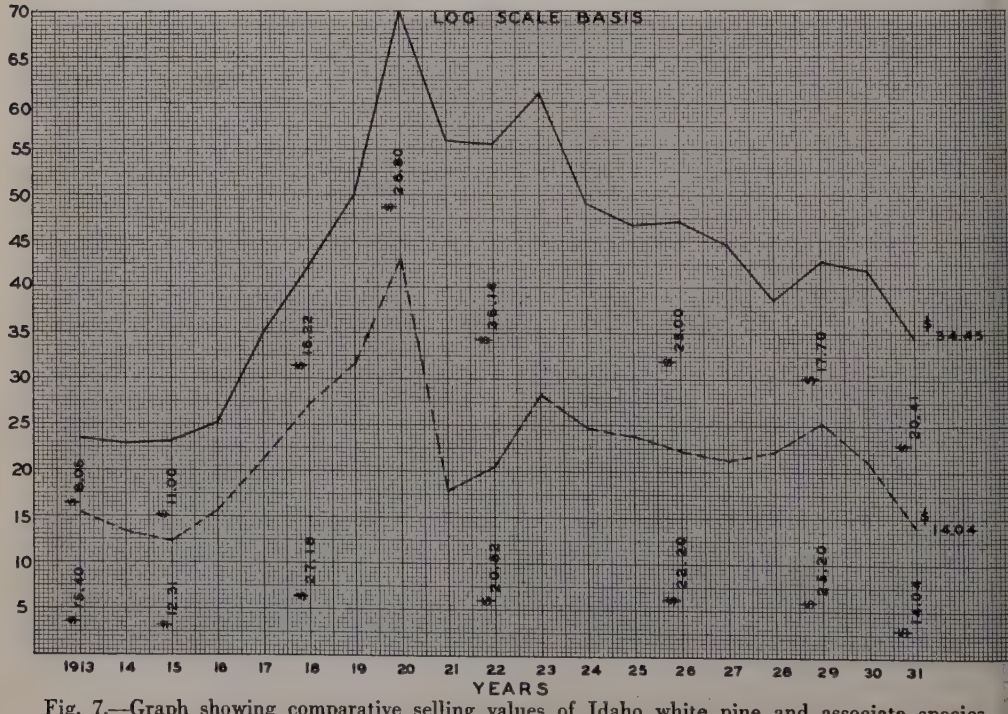

Fig. 7.—Graph showing comparative selling values of Idaho white pine and associate species.

pine alone (average, 1925-1929) was 25,000,000 feet. The annual production would be 844,000,000 feet if no white pine were cut in Idaho, Washington, Montana, and Oregon.

The cut of the white pines was only *half as much in* 1909 as in 1899, yet the value per thousand feet increased from $12.66 to $18.16.

The cut of white pine was only half as much in 1918 as it was in 1909, yet the value increased from $18.16 to $30.84 per thousand board feet.

In 1928 the cut of white pine had dropped 600,000,000 board feet from what it had been in 1918. The value was but little lower.

1899 production, 7,742,000,000, value per thousand, $12.66; 1928 production, 1,367,000,000, value per thousand, $28.71. Production only one-sixth as much; value, two and one-third times as much.

The most significant thing to me about Table 4 is that Idaho and Washington white pine although a long distance from market is worth more per thousand board feet than that from either the Lake States or New England. Wisconsin shows the highest value but when averaged with Minnesota and compared with Idaho and Washington the average is lower.

The low value of the eastern white pine is no doubt largely due to the cutting of small trees which in eastern white pine produce much more box and shop grades than do western white pine trees. Experience has shown that western white pine logs from stands 80 to 120 years old which average from 12 to 15 logs to the thousand board feet produce as great mill-run value as average stands. Although the amount of the select grade is negligible, most of the lumber is No. 1 and No. 2 common with little No. 4 and no No. 5 at all.

If any kind of timber is to be grown on present western white pine sites, the cost of fire prevention will be about the same as if white pine were grown. Abandonment or half-way measures of protection are not probable. The additional cost of blister rust control per acre for a 100-year rotation period at 3 per cent compound interest on an original cost of $2 per acre and 8 cents per acre thereafter is $87. This is $3.50 per thousand board feet on 25,000 feet of white pine per acre. We should average more than that. At 80 years the cost is $47, and at 20,000 feet per acre amounts to $2.35 per thousand feet.

Our present investment on these lands is high and must of necessity be increased by roads and other improvements. If the cost of the completed transportation system for the Clearwater National Forest is $2 per acre, and fire prevention costs will be 10 cents per acre per year, the investment at 100 years at the same interest rate as above is $99.17 per acre. This will never be paid for by mixed species if past experience is of any value.

Cuts and stumpage returns per acre on some of our best large white pine sales are given in Table 5.

TABLE 4

COMPARATIVE MILL RUN SELLING VALUES F. O. B. MILL OF WESTERN AND EASTERN WHITE PINE

Value per thousand board feet in dollars

	Western white pine			Eastern white pine			
Year	Idaho	Wash.	Minn.	Wisc.	New Hamp.	Maine	United States
1925	37.04	36.85	30.19	39.99	25.01	31.82	32.58
1926	36.49	36.31	28.92	39.45	24.56	27.18	31.36
1927	33.15	29.12	29.94	36.01	23.04	25.93	29.90
1928	30.28	32.54	28.78	33.22	23.41	25.16	28.71
Aver.	34.24	33.70	29.46	37.17	24.00	27.52	30.64

Conclusions

We may reasonably expect a stumpage return of $200 and more per acre from our good western white pine stands on the basis of average selling prices that have prevailed during the past 10 years. On the best and most accessible sites a return of $300 and more is conservative.

One-hundred-year-old stands are as valuable on a log-scale basis as older ones. The average age of the western white pine being cut now is about 160 years. Defect and breakage will be lower in younger stands.

Present investments and probably future investments in roads, trails and other improvements in the Inland Empire, with the additional yearly fire prevention cost, cannot be justified on the basis of growing any species except western white pine, if demand during the past 50 years is any indication for the future. In fact, well stocked stands of white pine with cedar, from present indications, are the only profitable investments on the Idaho forests.

White pine selling values have averaged $49.13 per thousand feet, log scale, since the War (1919 to 1931—see Figure 7). For the same 13-year period the average selling value of associate mixed species is only $24.33, making a spread of $24.80 in favor of western white pine. In depressions such as 1921 and 1930-31 mixed species and ponderosa pine are more quickly and seriously affected than white pine. Selling prices in 1931 average 16 per cent lower for white pine, 25 per cent for ponderosa and 35 per cent for mixed compared to the three-year average period (1928, 1929 and 1930).

The fact that the better species, such as western white pine, and the best grades of those species, are in more demand and suffer less in times of stress, indicates that "wood is not just wood," and probably is not going to be as early as some enthusiastic supporters of chemical and ground products would have us believe.

White pine has stood the test and maintained its position as king of softwoods over a period of 300 years, and its comparative position is now stronger than ever. There seems to be no reason for believing the ratio will materially change in the future, or that any other species can assure a lumber industry for the Inland Empire.

Table 5

COST AND STUMPAGE RETURNS ON NATIONAL FOREST TIMBER SALES

Sale	National forest	Thousand feet per acre		Stumpage per acre
		Cut	Left	
Doll chance	Coeur d'Alene	47.5	4	$340
Burnt Cabin	Coeur d'Alene	25.0	5	253
Uranus Creek	Coeur d'Alene	26.0	3	225
Sec. 29, Marble Creek	St. Joe	42.0	2	364
Bussell Creek	St. Joe	41.0	2	316
Beardmore Sale	Kaniksu	62.5	2	293

All payments for slash disposal and silvicultural measures were in addition to the above stumpages.

Editorial Note: Shall the white pines of the West be defended against blister rust? Does their value warrant the cost of ribes eradication? Blister rust is spreading rapidly but has not yet been found in the sugar pine region of California. It is virulent enough to wipe out the 5-needled pines utterly if it is allowed to spread uncontrolled. Private and public owners would be justified in accelerating the cutting of the susceptible species to avoid losing them to the disease. This might have serious consequences through ecological disturbances, low utilization

standards and, certainly, market confusion. Without the western white pine or sugar pine percentages many western acres would be submarginal from a profitable logging standpoint. As to reproduction, some foresters and some lumbermen honestly believe that the western white and the sugar pines are not worth the heavy cost of ribes eradication to continue the species because they believe ponderosa pine to produce an equally satisfactory wood except for such specialties as match blocks, piano keyboard stock, patterns, models and others. Nevertheless, as Mr. Neff has pointed out in this article, the market even in its present distressed condition is willing to pay a premium for any one of the white pines, eastern or western.

We need a summation of the whole situation before the above questions can be answered with any degree of finality. Mr. Neff's is an important contribution to this end. Articles on other phases of the problem have already appeared in this JOURNAL. The Editor invites further discussion of this important subject.

LIGHTNING FIRES

More than 200 forest fires have been started by lightning in a single day on the national forests of Oregon and Washington.

FORESTS AND STREAMFLOW
A DISCUSSION OF THE HOYT-TROXELL REPORT

By W. C. LOWDERMILK

Senior Silviculturist, California Forest Experiment Station

The Hoyt-Troxell report is an attack upon the widely accepted belief that watershed vegetation must be kept intact for the most favorable influence upon stream flow and erosion and flood control, and, that the negative values of the vegetation, because of transpiration losses, are far outweighed by the beneficial effects. The Hoyt-Troxell report has had wide circulation; from several parts of the World we learn that it has mislead engineers as to the value of watershed cover for the region in which the study was conducted. The conflicting evidence of various recent contributions emphasizes the importance of correctly evaluating the factors involved and that a complete algebraic summation must be made of all plus and minus factors to furnish the correct basis for watershed protection measures. Dr. Lowdermilk's careful analysis of the authors' data and conclusions provokes and calls for further discussion of this report and of investigation of the subject in general by foresters and engineers.

THE Hoyt and Troxell report (9) is a recent contribution to the subject of forests and streamflow. It is important because it reopens questions which require examination in watershed management, especially in irrigation regions and because the authors' findings are contrary to these propounded by foresters. The report has received attention in foreign as well as in American forest and engineering circles.

Conclusions of the report are summarized as follows:

1. "Forests do not conserve the water supply."

2. Contrary to widely quoted opinion the increase in run-off is not confined wholly to flood periods.

3. "Removal of vegetative covering clearly increases normal flood heights; - - - - small new growth in the case of Fish Canyon exercised practically the same effect as original cover in reducing flood crests."

4. "The belief that forests increase summer run-off and shorten low-water period is an outstanding fallacy as far as areas under study are concerned."

5. Average summer minimum flow was increased in Wagon Wheel Gap experiment about 12 per cent and in southern California more than 400 per cent, and time of occurrence was delayed about 30 days.

6. Deforestation made no appreciable change in low flows during winter in the Wagon Wheel Gap experiment.

7. "Erosion results from surface flow." In southern California denudation increased erosion as a direct result of increased surface run-off.

The authors' deductions from these conclusions are, that in basins where shortages in water supply are becoming critical and justify large expenditures for water development, the maintenance of forests for "conservation of water supply" may have an effect exactly opposite to that desired. The question then is raised whether, in regions where water supply is the controlling factor, the value of increased water supply does not outweigh benefits of lowered normal flood flows and decreased erosion, when these benefits can be obtained by shrubs or other small growth without loss of water occasioned by forest growth.

The conclusions just stated are based upon two watershed studies located in widely diverse regions; the Wagon Wheel Gap experiment (1) and a hitherto unre-

ported study in southern California. Data of the former study were worked up by Hoyt and Troxell to show cumulative increases in flow following deforestation. The Wagon Wheel Gap experiment was conducted by the U. S. Forest Service and the U. S. Weather Bureau from 1910 until 1926 on two similar contiguous watersheds, designated A and B, of 222.5 and 200.4 acres respectively. These areas are located in southern Colorado at the headwaters of the Rio Grande at elevations above 9,000 feet and are exposed to similar meteorological conditions. In 1919 watershed B was deforested, the slash piled in windrows and burned in 1921. Promptly following the burn a growth of grass, herbs and aspen shoots sprang up and clothed the area. Throughout the period accurate measurements of run-off and meteorological observations were recorded and form the basis of an exhaustive report (1).

The Wagon Wheel Gap area lies within the snow belt of a continental climate in which an annual precipitation of slightly over 20 inches is characterized by two approximately equal maxima, one as snow in winter and the other as thunder storms or convectional storms in summer. In this region the regimen of flow of the Rio Grande is naturally well regulated, showing by channel conditions a minimum degree of sedimentation and irregularity of flow.

The second watershed study was located within the coastal mountain range in southern California. In 1916 an investigation on streamflow measurements, without provision for complete measurements of precipitation, meteorological conditions or vegetation, was begun under the auspices of the Water Resources Division of the U. S. Geological Survey in coöperation with Los Angeles County. In August 1924 a forest fire burned some of the drainage areas under observation. Of these Fish Creek was selected by the authors to establish the effect of fire on run-off. Santa Anita Creek remained unburned and was selected to serve as an integrator of climate conditions and as a basis of reference for computation of normal discharge of Fish Creek following the fire from 1924 to 1930. New growth sprang up in Fish Creek drainage following the fire as is shown in Table 2 and Figure 2. Precipitation at Mt. Wilson, an eminence on the west side of Santa Anita drainage was used on the assumption that precipitation was uniform over both drainages. Santa Anita and Fish Creek drainages lie within an altitudinal range of 1,500 and 5,000 feet, in a Mediterranean type of climate, which is characterized by precipitation with one distinct maximum in winter and by long hot dry seasons from spring to autumn. Regimens of streamflow exhibit characteristic semi-arid type of irregularity with well developed outwash fans of coarse detrital material.

In past geologic time torrential flows have excavated gorges and steep-walled valleys from upthrust mountain blocks, and have deposited the detritus in downthrown valleys to form detrital filled basins to depths up to 2,000 feet. These basins furnish the most ideal storage for water supply from which fully 90 per cent of water supplies are pumped in southern California, omitting importations from Owens Valley (6). Replenishment of these underground basins with flow from flood discharges of mountain streams comprises the major problem in water conservation in southern California (4, 8).

Adequacy of the well prepared Hoyt and Troxell report to support the author's conclusions and deductions requires examination. A refinement in expressing ratios of flow of one watershed in terms of another on the basis of daily rather than monthly discharges has been employed. The course of such ratios for rising and

falling stages of watersheds A and B of the Wagon Wheel Gap experiment is given. The same data for Santa Anita and Fish creeks are unfortunately omitted. This is the more regrettable since the conclusions are based primarily upon the southern California experiment. It is a very vital omission.

Responses in storm run-off are made with the assumption that rain fell in equal depths over the two watersheds, and that such fall by storms bore a definite ratio to rainfall records taken on Mt. Wilson at the observatory. It is apparent on examination of Table 1 that this assumption is only partially correct. When annual rainfall is plotted for stations surrounding the drainages in question, fair agreement from 1918 to 1924 occurs: agreement for the following 5 years is not so good, as may be seen for seasons 1924-25, 1925-26. While these variations place a limitation upon accuracy of indicated responses following denudation from fire, they are not sufficient to disclose a major effect on flood run-off. Heavy rains are more general than light rains and may be expected to have fallen more equally over the two drainages.

In the first place the authors' conclusion No. 3, cited above, "Removal of vegetative covering clearly increases normal flood heights; . . . . . ," appears to be amply justified. A further analysis of the original data is shown in Figure 3. This conclusion also agrees with the writer's experimental studies on run-off as measured in plots (10).

Importance of this conclusion resides in its refutation of oftcited conclusions by Chittenden (5).

It is in place here to call attention to "outstanding fallacies" in the memorable Chittenden paper, one of which is that the "bed of humus" or litter of a forest floor is reported to be the chief agent of forest cover in absorption of precipitation. By

TABLE 1

ANNUAL PRECIPITATION OF SELECTED STATIONS SHOWING IRREGULAR VARIATIONS OF CATCH

Southern California

Hydrologic years[1] 19-	18-19	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30	Average
Mt. Wilson	21.98	27.17	34.28	60.26	24.48	16.76	21.91	36.26	33.37	19.78	20.68	23.00	28.52
Big Santa Anita	——	——	33.95	57.33	26.71	16.05	21.15	39.60	39.17	18.46	23.03	22.68	29.81
San Gabriel Intake	17.74	25.55	26.30	57.58	23.60	14.20	16.95	31.42	34.19	15.26	23.10	——	25.99
Pasadena	14.60	16.77	19.59	29.36	14.01	8.94	12.88	22.44	25.13	13.73	16.42	15.79	17.78
Monrovia	16.09	19.69	24.41	31.73	17.16	11.87	16.34	22.21	27.24	12.84	17.57	18.33	19.03
San Antonio	19.99	30.43	34.58	55.35	27.02	19.46	19.89	37.01	38.67	18.40	28.10	27.19	29.67
San Antonio Intake	19.20	27.98	32.90	54.18	27.66	19.76	19.36	37.34	38.51	20.41	——	——	29.72

Compare, for example, years 1925-26 and 1926-27 using the catch of Big Santa Anita as starting points. Variation of 3 to 5 inches in opposite directions occur.

[1]Water or hydrologic year, October 1 to September 30.

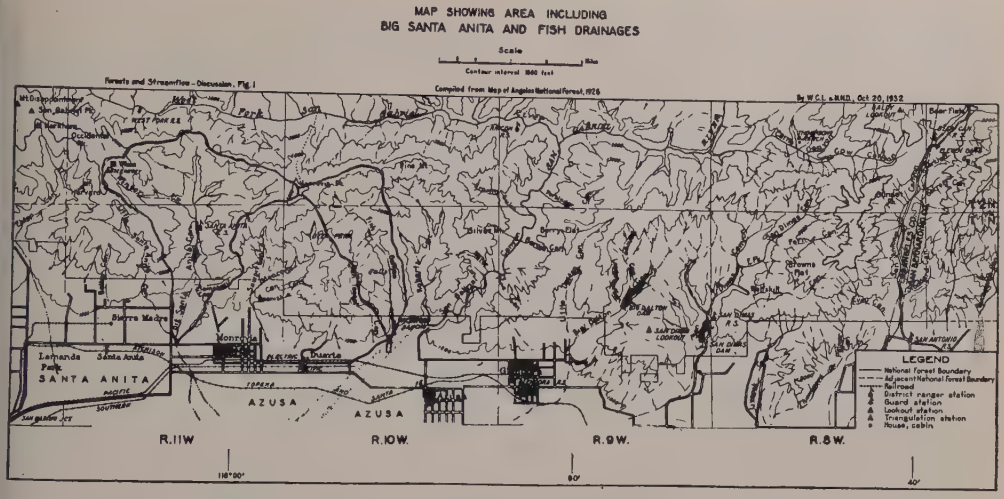

Fig. 1.—Relation of watersheds to rainfall stations.

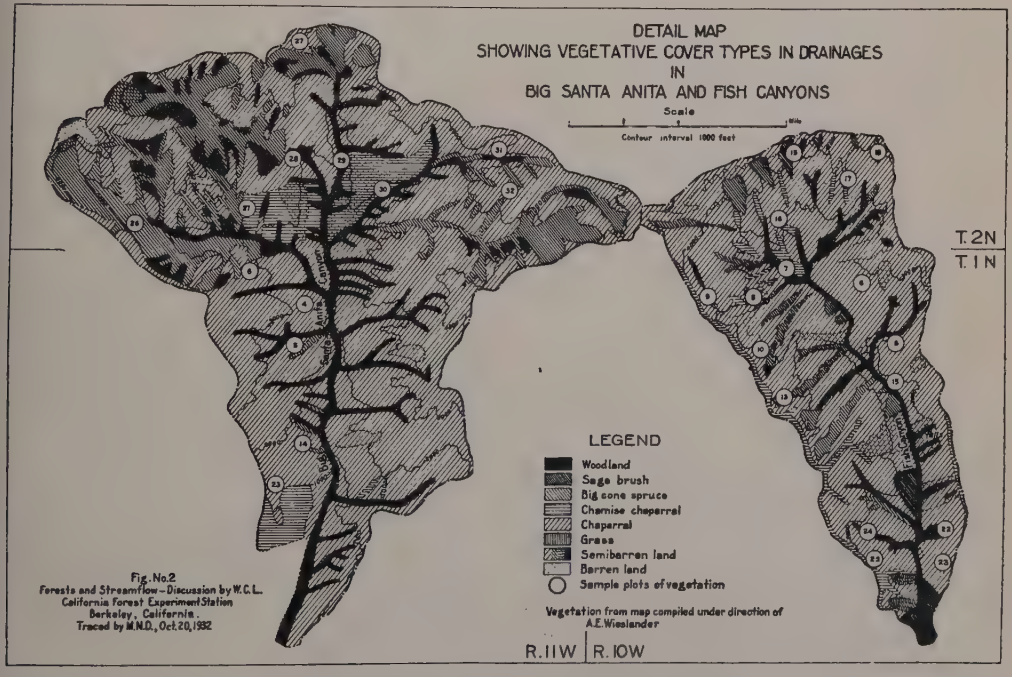

Fig. 2.—Map of Santa Anita and Fish Creek drainages showing coverage by vegetative types and location of sample plots of 100 mil-acres or 0.1 acre each. Canyon-bottom vegetation of the woodland type was burned out clean above the falls in Fish Creek but was saved below the falls.

inductive reasoning Col. Chittenden concluded that when this bed of humus is saturated the forest may be expected to exert little influence on run-off. More recently the reviewer's studies (10) have shown that the capacity of a layer of forest litter to absorb water is of small importance in comparison with its function to maintain surface waters clear and the absorption capacity of underlying soil at its maximum. The mantle of soil in the final analysis is the absorbent of precipitation, especially of heavy precipitation, —not the forest. Forest cover, and particularly the layer of litter which it produces, furnishes conditions which make for maximum water and erosion control on watershed surfaces. The more intense the rainfall, the more effective is this influence of the forest.

It is difficult to understand why Col. Chittenden's paper with fallacious conclusions should continue to be cited as being authoritative in textbooks and papers, when the conclusions of Swain (16), past president of the American Society of Civil Engineers, are certainly more nearly in accord with the facts in the forest. It appears, furthermore, to have escaped the authors that their conclusion thus refutes conclusions cited in Chittenden's work.

In the second place the authors' conclusion No. 7, that in southern California denudation increased erosion as a direct result of increased surface run-off is of special importance in problems both of flood control and of water conservation. It is a commonly observed result of forest fires within the chaparral forest region. The great importance of erosion and detrital-laden flood flows on flood control and water conservation will be examined in more detail in connection with treatment of another feature of the study below.

Aside from these two confirmatory contributions of the Hoyt and Troxell report, certain shortcomings require examination. Mead (14) correctly calls attention to an inadequate treatment of geological structure and soil in the southern California study. These features are in no way treated as thoroughly as in the Wagon Wheel Gap experiment.

Especially incomplete is the description of vegetation, components of which are specified as sumac (*Rhus* sp.) and mountain mahogany (*Cercocarpus montanus*). In this respect the study is reminiscent of the Merrimac watershed study by Col. Burr (3), in which important conclusions were drawn without data on kind or area of forests involved. The inadequacy of description of vegetative cover is apparent when compared with Table 2 and Figure 2, in which data collected under the direction of A. E. Wieslander for the California State cover-type map were generously supplied the writer and are summarized. Wieslander's vegetative survey was made in 1928, four years after the burn in Fish Creek drainage. Dominant vegetation was mapped and sampled by plots shown on the map.

Apart from the description of vegetation on the slopes, the Hoyt-Troxell report is entirely misleading with respect to the condition of the canyon-bottom growth of alders, willows, sycamores and oaks,—woodland type of the map. It is stated by the authors that this growth was protected from fire; and so it was below the falls (Figure 2). Above the falls, however, the mesophytic sub-irrigated canyon bottom growth was entirely killed as was checked by the present writer and recorded with numerous photographs. This discrepancy of fact and description imposes an important limitation upon the conclusion, especially regarding summer flow, which will be referred to again.

The most important point in the Hoyt-Troxell report is the effect of deforestation by cutting in the Wagon Wheel Gap

experiment and of denudation by fire in southern California on summer flow. It was found that the actual summer flow in both studies was greater than the computed normal for the respective watersheds if forest cover had been intact. In the case of B watershed of the Wagon Wheel Gap experiment the increase was 12 per cent and in the case of Fish Creek of southern California 400 per cent. The importance of this finding resides not as much in indicating substantial increase in yield of water as in new and conflicting information upon a widely accepted belief. The increase in summer flow in watershed B of the Wagon Wheel Gap is relatively small and may be explained by reduced interception of summer rains, occasioned by a forest cover prior to deforestation. The finding is used to support by analogy the finding of a high percentage increase of summer flow in southern California. The relative amount of increase as compared to total flow is shown graphically in Figure 3 and in Table 3 to be very small. It is, however,

TABLE 2

COMPOSITION OF CHAPARRAL VEGETATION IN FISH AND BIG SANTA ANITA CANYON. BASIS: 25 DETAILED SAMPLE PLOTS. MAPPED UNDER DIRECTION OF A. E. WIESLANDER, CALIFORNIA FOREST EXPERIMENT STATION—1928

(Riparian or canyon bottom vegetation not included in this table)

Common name	Botanical name	Big Santa Anita drainage: Per cent coverage average[1]	Fish Creek drainage: Per cent coverage average[1]
Chmaise	*Adenostoma fasciculatum*	20.00	10.0
Manzanita	*Arctostaphylos canescens*	4.5	6.0+
California sage	*Artemisia californica*	T	—
Whitebark soapbloom	*Ceanothus divaricatus*	8.0	7.3+
White thornbrush	*Ceanothus crassifolia*	13.0	1.2
Ceanothus	*Ceanothus oliganothus*	4.8	3.7
Birchleaf Mt. Mahogany	*Cercocarpus betuloides*	7.6	4.0
Wild buckwheat	*Eriogonum fasciculatum*	0.9	2.4
	Grass	T	2.0
Christmas berry	*Photinia arbutifolia*	4.5	3.5
Hollyleaf cherry	*Prunus illicifolia*	—	4.6
California scrub oak	*Quercus dumosa*	8.0	11.0
Scrub interior live oak	*Quercus wislizenii* var. *frutescens*	8.0	5.6
Scrub canyon live oak	*Quercus chrysolepis nana*	—	0.6
Deerweed	*Lotus scoparius*	—	3.7
Black sage	*Salvia mellifera*	4.0	2.0
White sage	*Salvia apiana*	2.5	3.6
	Rhamnus crocea var. *illicifolia*	2.8	1.4
Sugar bush	*Rhus ovata*	4.0	5.5
Laurel sumac	*Rhus lauriana*	1.5	—
Miscellaneous species		1.4	4.9
Bare surfaces		4.5	17.0
Litter		0.5 to 3 in.	Trace
		100.0 Unburned	100.0 Burned over 1924

[1]Per cent coverage refers to dominant vegetation. Subordinate species under dominant cover are not listed.

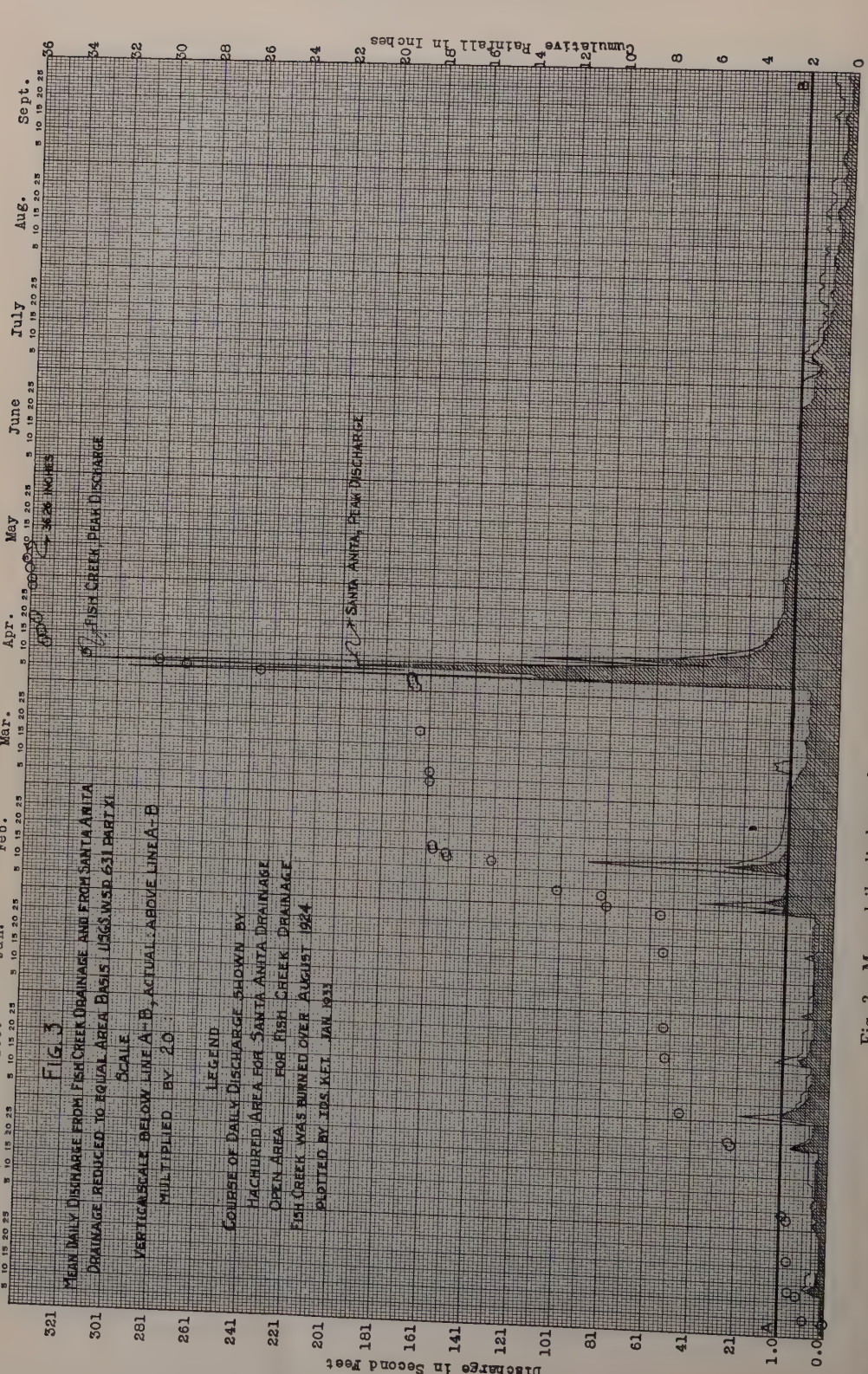

Fig. 3.—Mean daily discharge from Santa Anita and Fish Creek drainages.

the discovery of this increase which furnishes the basis of the Hoyt and Troxell conclusions, Nos. 1, 2, 4 and 5, and for the deduction that "the maintenance of forests for conservation of the water supply may have an effect exactly opposite to that desired," and further that such increased water supply may outweigh benefits of lowered normal flood flows and decreased erosion.

Forests have been long known to extract considerable quantities of water from soil and to transpire it into the atmosphere. Forest plantations have been employed to dry up swampy areas. Ototzky (15) established the fact that forests depress ground water levels lower than steppe grass cover. Thus no claim can be made on the one hand that forests transpire water and on another that they conserve by increasing the quantity.

Increased summer flow following the fire in southern California can not be ascribed to reduced interception of summer rains as in the case of Wagon Wheel Gap. Quite another explanation is required. The reviewer in a former paper (12) has set forth an analysis of factors affecting the yield of water from southern California watersheds. The salient points are that the mantle of vegetation subdivides into two distinct types, as may be noted in Figure 2, namely: vegetation of drained slopes (chaparral) and vegetation of sub-irrigated canyon bottoms,—so-called riparian vegetation. Chaparral vegetation on drained slopes, under California climate, has at its disposal after the end of the winter rainy season only that supply of moisture retained by the soil of the root zone against the pull of gravity. This is the available moisture between water-holding capacity and wilting point. A fire in the dry summer will not release water from such drained soils. Owing to the depleted condition of the soils little or no vegetation covers burned slopes prior to the winter rains which, finding bare ash-covered slopes, produce storm flows of run-off heavily charged with ashes and fine soil. Violence of floods is dependent upon intensities of rainfall. Very heavy rainfalls on freshly burned watersheds frequently produce mud flows of great destructiveness.

In the succeeding spring regrowth of sprouting vegetation and the usual dense coverage of volunteer annuals may be counted on to extract, during the long hot dry season, moisture approximately if not completely to the wilting point from the soil. The soil is occupied by roots of sprouting vegetation, which have the same extension as prior to the fire, and by invading roots of new growth. In the event that root zones are not as fully

TABLE 3

COMPARISON OF RUN-OFF FROM FISH CREEK DRAINAGE AS MEAN DAILY DISCHARGE AND AS SUMMER FLOW AFTER BURN

(Computations on basis of the Hoyt-Troxell data)

Hydrologic year	Discharge in inches depth			Summer flow			
				Fish Creek			
	Big Santa Anita	Fish Creek					
		Normal	Actual	Normal	Per cent of annual	Actual	Per cent of annual
1924–25	1.24	1.07	3.54	0.01	0.90	0.15	4.24
1925–26	7.77	11.80	14.92	0.05	0.40	0.33	2.21
1926–27	9.24	13.07	14.65	0.14	1.07	0.46	3.14
1927–28	1.79	1.79	2.47	0.00	——	0.10	4.05
1928–29	2.17	2.32	3.01	0.00	——	0.04	1.32
1929–30	2.26	2.35	3.09	0.01	0.43	0.04	1.29

occupied the first season following a fire as prior to a fire, an increase in run-off coefficients, other factors remaining the same, may be expected. Water rather than temperature is the limiting factor in development of regrowth on burns during the succeeding long dry season. Therefore, it is rather the available moisture in the soil than size of plants that determines the amount of moisture transpired by vegetation. Thus size of plants, as supposed by the authors in their deductions is not a measure of amount of transpiration loss from a watershed in southern California. The rate may be changed but not the amount for that is determined by available soil moisture within root zones.

Increase in yield by reducing transpiration losses from slopes would require that the vegetation be permanently killed, as by smelter fumes. A perfectly bare watershed would surely increase total yield without regard to its regulation or usefulness. Rapid coverage of burned areas by vegetation, however, is a conspicuous feature of the chaparral region, but its favorable influence in run-off and erosion control through the production of ground litter is restored only after 4 to 10 years. It would be more difficult to keep vegetation off the mountains than completely to prevent fires in the chaparral region. Thus gains in water yield of summer flow from drained slopes can not be looked upon as an important source of increased water production.

Studies on the effectiveness of rainfall made by the California Forest Experiment Station (13) have shown that losses of rainfall by direct evaporation from bare soil comprises from 50 to 80 per cent of total rainfall, varying with the distribution intensities and amount of rainfall by storms. There remain a number of factors yet to be evaluated relating to relative evaporation and transpiration losses. Certainly the erroneously designated "consumptive" use of chaparral can not be totally recovered in streamflow by burning these forests in southern California.

Quite another situation obtains with the riparian or canyon bottom vegetation. It is typically mesophytic, or moisture loving vegetation, consisting of alders, willows, cottonwoods, sycamore, bay, and oak. It has at its disposal throughout the long dry summer an abundant water supply in canyons of perennial flow such as Fish Creek of the study. Large quantities of water are returned to the dry summer atmosphere by transpiration. Two studies on such use of water by canyon bottom vegetation are in progress. Blaney (2) in applying the losses measured in Cold Water Canyon ascribable to transpiration by alders and similar canyon bottom vegetation to Fish Creek shows that consumption of this vegetation in 10 lineal miles of canyon should have equaled the equivalent of 1.00 inch of rainfall over the watershed. During the year prior to the fire the total annual run-off was only 1.00 inch over the watershed, and following the fire the normal run-off was 1.07 inch. Thus the canyon bottom vegetation apparently consumed approximately the total annual run-off in 1923-24. Increased flow during the summer following the fire was only 0.40 inch over the watershed. Thus on the basis of comparative studies within the same region, more than the total increase of summer flow, which occurred in Fish Creek, may be accounted for by reduction in transpiration losses from canyon bottom vegetation, which was killed by fire above the falls. As regrowth developed, however, summer flow decreased.

The absurdity of recommending the denudation of watershed slopes by fire in order to increase streamflow through the reduction of transpiration of vegetation of canyon bottoms, which covers about 3 per cent of the total watershed, becomes apparent. Moreover, salvaging of water con-

sumed by canyon bottom vegetation is fully justifiable. Gravity mountain water has reached values of from $100,000 to $200,000 per second foot of continuous flow. A much more effective way of salvaging these losses than burning off the entire watershed in order temporarily to reduce transpiration of sub-irrigated canyon growth, consists in piping water out of canyons past thirsty alders and similar growth. If there were no deleterious results from burning watershed cover in California, employment of the measure to increase summer flow could not be justified. In view of serious consequences in salvaging storm waters attendant on forest fires, such a proposal as included in the Hoyt-Troxell report is the more unfounded.

The lack of adequate analysis and evaluation of the several factors that account for relatively small increase of summer flow invalidates both conclusions and deductions of the Hoyt-Troxell report for application, not only to California but to other regions as well. The lamentable inadequacy of the report is shown by special emphasis on summer flow variations which comprises in the study less than 5 per cent of total annual flow, whereas problems affecting conservation of from 95 to 99 per cent of annual stream discharge are omitted from consideration. In this respect the report grossly misrepresents water problems facing California.

As has been indicated above the principal method of conservation of water is to sink storm run-off into underground detrital-filled basins. Cecil (4, Pa. 1834) calls especial attention to conditions necessary for maximum percolation of storm flow into underground basins. Two essentials for storing underground the maximum of storm flow are (1) regulated flow, and (2) freedom from silt. Unregulated and muddy flood waters waste to the ocean and are permanently lost to use. The average annual loss due to wastage for lack of regulation and heavily silt laden condition chiefly from burned watersheds is 150,000 acre feet for San Gabriel and Los Angeles Rivers and 33,000 acre feet for Santa Ana River, making an annual total of 183,000 acre feet. Stored water has a value of from $15 to $20 per acre foot. Estimated average annual losses due to wastage to the ocean is therefore between two and a one-half to three and one-half millions of dollars. One of the principal tasks in water conservation is to salvage these losses by an extension of spreading and sinking works. Streamflow water is refined gold; it is the residual that has escaped the losses due to evaporation and transpiration over which little control has yet been devised. Salvaging streamflow has an assurance of certain increases to supply.

Combined with water storage is flood control. An extensive program of flood-control dams has been pursued for a number of years by Los Angeles County. Thus far 11 large dams have been completed, and two of the largest are now under construction. Reservoir storage behind these dams costs up to $260 per acre foot, being 10 to 20 times usual costs. They serve to impound storm flow first for protection against flood damage and second for regulation of flow for the maximum storage in underground basins by spreading on outwash detrital fans. Effectiveness of these costly reservoirs is dependent upon freedom from accumulations of erosion detritus from drainage slopes. Satisfactory reservoir sites are scarce, which further enhances the need of preserving the capacities of existing reservoirs. The mantle of chaparral vegetation proves to be the most effective ally in regulating storm flow as well as in safeguarding costly flood storage capacity. Chief Engineer Eaton of the Los Angeles County Flood Control District places the value of chaparral cover above that of

check dams and flood control dams (7).

He further says, *ibid.* p. 23, "This normal mountain vegetation is the most effective and economical agency in the regulation of flood flows, increasing percolation and preventing erosion."

Muddy storm water seals up spreading grounds, rendering them practically impervious. It is common practice during water spreading operations to let muddy water waste past diversion gates to the ocean in order to safeguard favorable conditions of spreading grounds to receive clear water. Clarity of water is of highest importance in any program of conservation or salvage of winter storm flow from southern California watersheds. These considerations have to do with from 95 to 99 per cent of the annual discharge of streams, which occurs during winter rainy seasons. Relative importance of regulation of flow and its suitability for sinking into underground basins to that of summer flow is represented by respective quantities of water involved. The Hoyt-Troxell report presents an amazingly unbalanced picture of the many-sided water problem in California.

Accordingly, it is astounding that the relation of flood run-off from burned watersheds and consequent accelerated erosion receive such scant attention in this report. Damages to streets, bridges, railways, highways, orchards, and other property are not taken into account. Losses of storm run-off from burned watersheds which may exceed many-fold total summer flows are overlooked. A study which will guide in enlightened management of watersheds in California must take these various phases of the problem into purview in order to make any significant contribution to the subject.

A number of problems are yet to be solved: factors involved are generally known; it is their evaluation which is yet to be made to furnish the basis for any modifications in management of these important water-yielding drainage areas. It is primarily a task of evaluating the factors making up a complex of responses affecting run-off coefficient. The Hoyt-Troxell report in the writer's opinion has failed satisfactorily to evaluate any factors; it has rather over emphasized certain factors and under emphasized others. The report opens up the question of forest fires on summer flow. In this respect the conclusions and deductions are misleading as to the cause for increases in summer flow in Fish Creek. Likewise the implication that under California conditions tall growth transpires more moisture than low vegetation is shown to be untenable. An examination of Figure 3 where the flow up to 1.0 second foot is magnified 20 times with respect to the remainder of vertical scale, discloses a graphic comparison of relative significance of storm run-off and summer flow.

Discussions of the paper appearing in the *Proceedings* of the American Society of Civil Engineers demonstrate in several instances how the report has misled students unfamiliar with conditions and problems surrounding water development and conservation in southern California.

Analogies in results in Wagon Wheel Gap and southern California do not coincide in causes and the studies can not be used scientifically to support conclusions of either study.

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LEADERSHIP IN FORESTRY AND LUMBERING

By E. T. F. WOHLENBERG

Leadership involves courage, intelligence, initiative and knowledge, assumed to make up 50, 30, 15 and 5 per cent respectively of the total. Knowledge and a sort of latent intelligence are characteristic of foresters, but courage and initiative are practically dormant. Among lumbermen, initiative and a blind courage predominate. The two groups should get together and merge their separate resources in the qualities necessary for a well rounded leadership. This article was inspired by the recent annual meeting of the Society.

DURING the business session at the recent annual meeting of the Society of American Foresters there were several rather spirited discussions on the leadership or the lack of it in the forestry profession and the lumber industry. As a result it seems fitting to make an analysis of the fundamentals of leadership and how they have been applied in the two fields above mentioned.

There are many differences of opinion as to the qualities which go to make up leadership. The clearest analysis of the necessary fundamentals that has come to the attention of the writer, was made by a man who was a great military leader during the World War and who since then has been a great leader in large engineering projects.

This recognized leader stated that there are four fundamental qualities necessary for leadership. In the order of their importance he gave them as: (1) courage; (2) intelligence; (3) initiative, and (4) knowledge. If weighted on the basis of 100 per cent this leader would apply the following weights: courage, 50 per cent; intelligence, 30 per cent; initiative, 15 per cent; and knowledge, 5 per cent. In discussing his analysis he stated that knowledge is the most common and the cheapest commodity on the market. He also stated that no man or group of men could be great in leadership without the first two fundamentals, that is courage and intelligence.

There is, undoubtedly, much difference of opinion as to the importance of each of the fundamental qualities. It does appear, however, that if there is insufficient knowledge and proscrastination and inability to use it, leadership in any direction might go astray and get itself into serious difficulties.

The four fundamentals appear to be necessary in either individual or group leadership. No argument is offered here for their relative importance except to say that all are important and that the first two, courage and intelligence, should probably be given greater weight than the last two, initiative and knowledge. The first two are inherited qualities while the last two are largely acquired.

With our principles of leadership defined let us see what the picture is in the forestry profession and the lumber industry. At present both fields of endeavor present a very sad spectacle, but the picture is quite different in each case. The disparity has been brought about to a large extent by a decided inequality in the distribution of the four fundamentals among the two groups.

In the forestry profession of this country, after some 25 years of effort, there is enough knowledge to practice forestry from the tropics to the Pole. There is no place on the North American continent from Mexico to Hudson Bay for which some forester could not recommend just what to do to practice satisfactory forestry. There is also a great research organization which is adding daily to our

store of knowledge. In spite of all this, practically nothing has been accomplished in the establishment of private forestry in this country. A certain amount of intelligence has been exhibited in that public forestry is pretty well under way and the profession has not made any serious mistakes. The two fundamentals of leadership which have been working overtime are knowledge and a sort of latent intelligence. The two fundamentals which have been practically dormant are courage and initiative.

In the lumber industry the picture is just as bad, but as stated before, quite different. The lumbermen have been building great manufacturing plants, bridges and logging railroads, and the watchword seems to have been more and more expansion. Trade extension and up-to-date marketing have lagged far behind and at present excessive over-production has just about paralyzed the business. In the lumber industry there certainly has been no lack of initiative as far as expansion is concerned. There has been a certain amount of blind courage particularly where a man has invested his own money. Where the operator is working on money obtained from some of our well-known bond issues it appears that much more initiative was displayed than courage, because it is always easy to spend the other fellow's money. When the individuals in an industry expand to a point where the capacity is anywhere from 30 to 60 per cent greater than could possibly be required even in boom times, we can give them credit for lots of initiative and a certain amount of courage, but we cannot credit them with making much use of knowledge or intelligence with reference to the needs and trends of their industry.

It would seem then, that of the fundamentals that go to make up leadership in a successful lumbering and forestry enterprise, the lumbermen possess 65 per cent and the foresters 35 per cent, and that one is not adequately equipped for leadership without the aid of the other.

The argument can be made, of course, that forestry is not necessary as far as the lumber industry is concerned. The fault with this argument is that the lumber industry is not the only one concerned; public interest is involved and can no longer be ignored. The public has suffered economic hardships through lack of forestry practice throughout the United States until they have reached even into the cut-over counties of the Pacific Northwest. Economic stability of the communities demand land use even though the type of forestry may be rather crude to begin with. The practice of forestry does not only mean selective logging and the growing of timber as far as the forester is concerned, but it offers also the best opportunity to obtain controlled production, equitable taxation, permanent railroads and manufacturing plants for the lumber industry, as well as permanent employment and permanent communities for the public. With forestry and the public interest as a base these benefits would be obtainable in spite of anti-trust laws.

Forestry and lumbering must eventually coöperate in this country just as they have coöperated either voluntarily or involuntarily for hundreds of years in the older countries of Europe. Forestry, in its broadest sense, after all must eventually be one of the important steps in the orderly production of lumber.

At present many of our leading economists tells us that long-range planning is indispensable in all of our important industries if our country is to survive. Foresters have been taught long-range planning in their schools and in their work. Forestry is, after all, nothing but long-range planning for the management of forest land and the production of wood. There are many problems to work out in order to establish the lumber industry on a long-time basis. These problems will

have to be solved largely by the long-range principles involved in the practice of forestry.

It appears that a golden opportunity has arrived. What has been done with it? Aggressive leadership to cope with the important problems before us was talked about but not displayed at the last annual meeting of our profession. Most of the papers were a rehash of old subjects which we have all heard discussed many times. The only paper which adequately emphasized the present situation was that of Dean Graves. But nothing was done about the important issues he so forcefully brought before us. His paper was not even discussed.

The lumbermen are casting about for some way out of their dilemma. The forces at work have created a condition where coöperation between the forestry profession and the lumber industry is not only feasible but extremely desirable. If that coöperation is not forthcoming in this critical period, the lumber industry will eventually destroy itself as a privately controlled industry. The result will be either public regulation or outright control. By making use of the knowledge and intelligence that does exist in the forestry profession and the initiative and courage that does exist in the lumber industry the fundamentals for a coöperative leadership are established.

A little more tolerance from each group toward the other is imperative. The forester's ideal is service to the public and the lumberman's ideal is the success of his operation. The lumberman must give more thought to the welfare of the public in well-laid plans for the future and the forester must give more thought to the immediate problems of the industry. The present crisis, as well as difficulties in the future, must be solved through long-range planning and united action.

Just what will the forestry profession do to assume its share of the responsibility in this coöperative leadership?

The demand for public recreational areas has become decidedly intensified during the past two or three years. Many persons, who a few years ago thought nothing of spending a week or two at an expensive seashore resort, are now confining themselves to group picnics and family parties at the state parks. Approximately 307,000 people visited the (New Jersey) state parks during the past summer. This large attendance has increased the need for additional improvements to handle the crowds, a condition which, in these times of reduced budgets, produces difficult administration problems.

From *New Jersey Forestry News*, July-Sept., 1932.

FACTORS INFLUENCING CHOICE OF SPECIES IN ARTIFICIAL REFORESTATION[1]

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Although this article refers specifically to New York conditions, it has much wider application. The author's theme concerns the reforestation of abandoned lands, and the need for classifying these lands as to their quality and accessibility and so adjusting the method of reforestation and the species used to fit the conditions rather than handling them all alike for simplicity's sake. On sites of poor growing conditions, uneconomically located, one should give preference to native species, cheaply established. On better growing sites having also better accessibility, a higher expenditure on better species and more intensive silvicultural methods are justified. The author offers a classification and evaluates certain species and planting methods.

THE most common problem which we face in the Northeast today in connection with reforestation is that of the abandoned old fields which are now considered more suitable for forest uses than for farming. Most of these lands have been deprived of their original forest cover for a long time, farmed with little use of fertilizer, and have been lying idle for a longer or shorter period. The humus content of the topsoil has decreased considerably, the soil hardened, and the soil fauna disappeared. The subsoil, however, is in most cases of such quality that it can produce a good forest growth very well. It is a reforestation problem that we are facing rather than one of afforestation. We do not have to deal with the difficult problems of the moorland in England and Wales, the heaths of Denmark or the sand dunes of western Europe; rather, we have to deal with the abandonment and successive reforestation of farmlands as was the case in north Germany after the 30 Years' War and later. These areas are sustaining extensive forests today.

Numerous older and younger plantations on old fields in New York and New England indicate the possibility of creating useful forests. It would undoubtedly be an easier and perhaps more profitable endeavor to improve and get the best out of the already existing forests than that of reforesting abandoned fields. However, it is of course possible, though it may not be easy, to create first class forests by artificial means on lands where present site conditions are rather far from those found on a natural forest site. We are already beginning to feel some of the difficulties in starting forests on bare areas and which we probably will encounter to a greater degree in the future, those of stagnation, weevil attack, pine shoot moth infestation, frost damage and icebreaks in plantations of which very few are as yet middle-aged.

The abandoned farmlands available for planting in the Northeast are in part easily accessible or partly somewhat inaccessible and remote from possibilities of intensive utilization. Some of the lands are good and will undoubtedly be able to produce a high yield from many different species. Some are poor and the limitations placed on the species which can be used advantageously are narrowly imposed. Undoubtedly most of the land belongs to the class of the poor rather

[1]Presented at a meeting held in New York City under the auspices of the Charles Lathrop Pack Foundation at Yale University, March 5, 1932.

than of the good site and is fairly inaccessible rather than benefitted by a good road system with short distances to the centers of intensive utilization.

One thing I believe we must learn from agriculture and also from certain other industries, is the intensive use of the areas which have naturally good conditions, while lands which offer poor conditions for production and utilization should be much more extensively used.

If we make a plantation today in the heavily forested regions of Maine or Vermont, we make it about in the same way as we do in parts of Connecticut or New York where the possibilities for selling the forest products are the best possible. Also, a plantation made on poor land, where it might not be feasible to produce more than 20 cubic feet per acre per year, is often made with even greater expense than the plantation on sites where it might be very possible and practical to produce 200 cubic feet per acre per year.

I believe we should work much more than we do today with intensive vs. extensive methods—intensive methods primarily to produce production forests and extensive methods by which we primarily establish protection and recreation forests.

It cost several times more to produce even the same species on poor land than it does on good land, and this applies even more when the accessibility of the land is taken into consideration.

For some time we have been greatly interested in determining the smallest diameter to which we may cut with a profit. We know that this diameter is considerably smaller at the foot of the mountains or near the market than at the top of the mountain. But this thought has, to my knowledge, never really been applied to reforestation where it ties in just as well as to the utilization end.

I therefore suggest that we work with a classification of the abandoned land along these lines. Much more research, especially in the economic phase, is required but I believe that already we may be able to classify the old fields into three groups.

1. Probably the smallest group, which should include land on which high production can be expected and where intensive methods can be applied.

2. This group will be an intermediate group and take in all land which does not definitely fall into any of the other groups. Here belong areas where we should tend to produce a forest serving both for timber production, protection and recreation, but where intensive methods, such as weeding, frequent thinnings, prunings, etc., scarcely will be used.

3. Probably the largest group, into which the inaccessible and poor land goes and where the aim should be to establish cheap forest covers, which should be cut, if at all, with long cutting cycles.

That such a classification is not only justified but also necessary is indicated by the difficulty we have at present in selling thinnings and even logs on inaccessible and heavily forested areas of the East. It is also valuable in this connection to notice the difficulty encountered with the disposal of the thinnings even in a densely populated country such as England, where the forest per cent is around 3. That the inaccessibility and the quality of the site, even within relatively small areas, mean much in regard to the intensity of forestry to be practiced, has been demonstrated clearly on the Pack Forest at Warrensburg. Several compartments are so well furnished with good roads that it is practicable to thin them at intervals of from 2 to 4 years, while some compartments are so inaccessible that it is a doubtful procedure from a financial aspect to remove even the mature timber with cutting cycles of less than from 10 to 20 years. These considerations which I regard as very important for successful forestry, have a strong bearing on our

choice of species.

In our Class 3, the poorer class of the land, both in respect to market and site conditions, we should try to work as cheaply as possible, depend as much as we can on natural reproduction, and, when artificial reforesting is necessary, use simple methods. If the local species are good, they should be used. Our aim should be to produce a forest which will be simple and cheap to establish and especially easy to maintain. Red pine will probably find great use in this class because it can be spaced widely and is a rather safe species when planted on suitable sites and originated from local seed. Also white pine will find a place in this class under conditions where the weevil danger is of small account.

In Class 1 of the lands, valuable species should be produced under intensive methods. Mowing, weedings, prunings, thinnings, intensive insect and pest control, belong here. We know from Great Britain that it costs about ten times less to grow Douglas fir on good sites than Scotch pine on poor sites, and five times less to grow Douglas fir on a good site than Scotch pine on a good site, and the accessibility is not taken into account even here. This alone seems to justify great attention to the fast-growing and valuable species, the good sites, and the accessibility of the land. Fortunately, good and accessible land is often found together.

White pine, yellow poplar, spruce, larch, walnut, ash, basswood, black locust, Douglas fir, and others, are trees with which we should work on these Class 1 areas, because we will find it more profitable to spend time and energy where our production and transportation factors are at their optimum than where they are at their minimum. This is what agriculture found out a long time ago and is a point which has even more bearing on forestry.

On these lands it may be necessary to work the soil mechanically before planting. The soil here may once have been an excellent mull but now, after exposure for a long time, has become so compacted that it is difficult by natural means to restore it to a good physical condition. Here it may be profitable to create an artificial mull by means of plowing. Subsoil plowing will probably be greatly beneficial very often and a plow such as the newly invented "drilling" which removes the sod, subsoils to a depth of 10 inches, and cultivates the strip, may be highly commendable for this purpose. An acre may be so worked with 4 feet between the strips for a few dollars. The rototiller may also find a place for the purpose of overcoming soil compactness and creating an artificial mull. Nurse crops of widely spaced light-demanding species, such as birch and larch, will be necessary for frost-tender species such as spruce and Douglas fir. Mowing of the grasses and weeds during the first few years after the planting, pruning of the best trees, and frequent thinnings, are means by which these good sites may be used in the best way and kept under full producing capacity.

In Class 2, forestry methods will be of an intensity between Class 1 and 3, the aim being to produce stands by cheap means for timber and pulpwood production. Frequent thinnings cannot be expected. The spacing must be rather wide and pruning probably applied only to a limited extent. If the site allows, spruce would be a valuable species here and could probably replace, somewhat, the now so frequently used pine which is so expensive to grow. More than 90 per cent of the stock planted in both New Hampshire and Connecticut in 1929 consisted of pine, in New Hampshire mainly white pine, and in Connecticut mainly red pine. Also larch and a mixture of larch and pine may fit into some areas of this class.

In summing up, the species to use on

the land where poor economic and growth conditions exists should primarily be native ones cheaply established and easy to maintain. On the other hand, where good economic and growth conditions exist the more valuable species should be grown under intensive silvicultural methods. Or, put in another way, it is better to invest $5 where we have good forestry conditions and get $6 or $7 back than it is to invest $2 where we have poor forestry conditions and get $2 or $1 back. Here, however, may be returns in the protection of the land and esthetic values which may be difficult to express in terms of money.

Turning to the influence of the climatic factors on the choice of species, we find, fortunately, a strong tendency to use seed of local origin and also some attempts, when the seed must be obtained from the outside, to procure it from regions of similar climate and from good stock. It may not be necessary that all species be subjected to such rigid requirements as are exacted for Scotch pine in some of the Scandinavian countries today. Here the seed to be used should not come from a climate where the mean temperature for the months of June-September or of September, respectively, is 1° C higher than the mean temperature of the planting field. We have examples of yellow poplar plantations in New York where the seed came from Tennessee, in which the growth and frost hardiness are excellent. Undoubtedly, in the long run, we will get the best results by sticking to the rule of using seed from regions where climatic conditions are as similar as possible to those of the given planting field. As already mentioned, I would not be afraid to recommend the most useful species for the better areas even if this must include some exotics. Few parts of the world have as many and as good species as eastern America, but within the different groups of trees there are still some which it would be advantageous to import from the outside. For example, we do not have a real fast growing spruce, while our present need for spruce is tremendous. The Norway spruce may fill this hole, and as it has been planted extensively throughout the Northeast with fairly good success, we have a basis for using it even today on a large scale. In fact, it is so common that we should use some of the good local stands for seed collection. This will not, of course, as yet cover the need, and the problem is then to determine the locality on the European-Asiatic continent from which to secure the seed. However, we should not stop there. The cost of growing Sitka spruce in Europe is considered to be only half of what it costs to grow Norway spruce. We may, therefore, find the sources from which to get the Sitka spruce and the sites where it can be grown best. Perhaps this will be in the states along the Coast, or perhaps in the mountains. I have seen it doing very well on tough moorlands in northeastern England where the annual precipitation is not more than 28 inches, and in Denmark the growth of a fifty-year Sitka spruce plantation was perfect on dune-like formations with a rainfall of only 21 inches. Also Douglas fir is not sufficiently experimented with in the East. We know that seed from California is winter-killed, while the Rocky Mt. form will stand the climatic conditions here. However, there are very few experiments with seeds from British Columbia from sources where we still have the fast growth of the Coast form, while the resistance to low winter temperatures, late spring frost and early fall frost, may be sufficient.

The climate outside of America which is most like New England and New York, is probably found in eastern Asia in Korea, the southern part of Hokkaido and the northern part of Honshu. Some species found there may fill another hole in our search for fast-growing valuable

trees. The Asiatic larches, *Larix dahurica*, *L. Koreensis* and *L. leptolepis* are probably superior to the native tamarack and may have better qualities than the European larch. Some of these larches can grow on very poor soils and even early thinnings can be utilized for fence posts.

There are many prejudices against exotic trees in certain parts of Europe as well as in this country, but if we analyze the matter we find that most opinions are based on uncertain information concerning the source of the seed. It is interesting to note that more than 40 per cent of the plants used under the British planting plan are of exotic origin and more than 30 per cent of the forest area in Denmark is carrying trees not included among the native species. But is on those stands that we find the highest yields and the greatest money profit.

In connection with the climate, I may mention that some of the greatest damage to coniferous plantations in New York State has been caused by ice storms. In a few cases plantations were destroyed. The various species, however, showed a marked difference in resistance to this injury; some are practically wholly resistant. From studies of 84 plantations we find that the species therein are subject to ice damage in the following order from greatest to least damage: Scotch pine, white pine, European larch, ponderosa pine, red pine, Norway spruce and northern white cedar. Red pine was damaged very little and cedar not at all, while Scotch pine was hit very hard. On the basis of these studies alone, I would be very conservative with the use of Scotch pine especially in the parts of the state where damage from ice storms is great.

We can, as stated, expect difficulties with Norway spruce on account of its susceptibility to late spring frost and early fall frost. This may be overcome partly by avoiding setting spruce in frost pockets, partly by finding races which are suitable for the climate, and partly by the use of cheap nurse crops.

As has been demonstrated on many areas where a series of species have been planted on the same site, many soils have the ability to support many different species. The poorer the soil becomes in its water-holding capacity, the fewer the number of species that can develop under optimum conditions. Also the more compact the soil, the fewer the species that can withstand and by natural means overcome the conditions. Probably we cannot expect that the chemical analysis alone can solve the problem of correlating species to soils, but physical analysis combined with growth data and ground cover types may take us further. To bring the abandoned agricultural soils back in a short time to a natural, healthy forest soil of full growing capacity, will cost more money than forestry can afford. This only means that we must use less exacting species which can gradually build up the physical structure and the organic and colloidal content of the soil. Many of these less exacting species may, in fact, be more desirable for practical purposes than some of the more demanding ones. We will prefer to grow red pine or larch rather than beech and soft maple. There are, however, in this field a vast number of unknown factors which must be but thus far have not been solved. It may be necessary to use empirical methods for some time perhaps, for the sake of the practical application. We should not stop here, however, but we may be forced to use them for a time. It appears to me that it is better to give the practitioner rough methods which can be used and tied in with his every-day problems than information which he cannot combine with his work.

The humus question is considered one of the most vital in present day silviculture. Much emphasis is being placed upon the effect of the different species on the

condition of the humus. This influence is undoubtedly great but should not overshadow the treatment of the stand, which probably is the most important of the changeable factors. I have also seen several highly productive pure Norway spruce stands maintaining an excellent mull. When economic and silvicultural interests are divergent, it may be necessary in some cases to follow economics and in some cases silviculture, but as a general rule I would follow silviculture more under the extensive conditions or in Class 3, and economics under the intensive conditions or in Class 1. In other words, I might produce a mixed stand on poor soils distant from centers of utilization, while I might want to work with a pure stand of a valuable and fast-growing species on the good site near good roads and wood-using industries.

Of the principal insect pests which are of real economic importance, the weevil and the pine shoot moth rank first. The damage of the weevil to the quality and growth of white pine should serve as a warning against the use of this species in regions and under conditions where the weevil damage is severe. Experiments might be undertaken with direct seeding of white pine by means of seeding machines after furrow ploughing. The establishments of white pine in this way should not cost more than from $4 to $6 per acre and the density of the stand would help to decrease the weevil hazard. Thousands of acres of cheap pine plantations have been produced by this method on abandoned farmlands in Europe and there is no reason why it should not prove successful with white pine and other American species. Also hardwoods could undoubtedly be brought into the plantations in this manner. The plantations should be made so that they can go without weeding and thinning, if necessary, until maturity.

Attack of the pine tip moth on red pine has been found only in a few instances in New York. The pine tip moth, besides having done much damage to Scotch pine in Europe, has also attacked jack and lodgepole pine. However, the moth has never inhibited the use of any of these species. According to reports from Connecticut, this pest seems to be very dangerous to red pine and it might therefore be advisable to import parasites from Europe to check the spread of the moth.

It would indeed be a great loss if we had to give up the use of red pine for reforestation. At present red pine covers only 17 per cent of the planted area in New York but it is to be expected and hoped that this figure will be increased.

There is no reason for increasing the percentage of the Scotch pine area but I believe this tree will continue to have a place in reforesting the poorest land. It is a cheap species to plant, a fairly fast grower, and easy to reproduce by natural means. If raised from a good race not attacked by the pine shoot moth, it has good economic possibilities.

White pine takes up more than 30 per cent of the planted land in New York and it is doubtful if this percentage should be expanded. So far it has proven to be an expensive species to use.

The Norway spruce area, which also is almost 30 per cent, may on the other hand be increased somewhat. It is not very exacting as to soil requirements but very tender to climatic conditions and demands careful establishment. The weevil is rather harmful to this tree but it has a natural ability to overcome crooks. The effect on the humus may sometimes be dangerous but if thinned right and the slash left to protect the ground, this difficulty can be overcome. Thinnings can be used early and we can undoubtedly consume all the spruce which can be

produced.

Larch, the European and the Asiatic, serve as excellent nurse-trees and do well in mixtures. They do not demand much of the soil and should fit into the climate. Larch occupies at present less than 2 per cent of the New York plantations and could be increased considerably if the sawfly and other pests would leave it in peace.

We have examples of excellent plantations of yellow poplar in the milder climates and better soils of New York. Even on quite sandy soils we have figures for unusually good growth of this species.

Also other hardwoods, such as basswood, black locust, white ash, walnut, oak, poplar, hickory and others deserve a bigger place in reforestation than they hold today. In New York only about one per cent of the planting area is taken up by hardwoods.

It is possible but not easy to reforest abandoned agricultural land satisfactorily. This has been the experience since the early days of forestry. However, I feel that we will obtain more purposeful results if we will adjust our methods to the existing conditions and work with greater concentration on our good and accessible lands, rather than on the poor and inaccessible ones.

Lightning Storms

The average lightning storm, in Washington and Oregon, travels between 6 and 20 miles per hour, and very few travel faster than 40 miles per hour, according to measurements by the Pacific Northwest Forest Experiment Station.

Most of the lightning storms in Washington and Oregon travel from southwest to northeast, occur during the afternoon, and seldom exceed 40 miles in length.

ASPEN COMPETITION IN NORWAY PINE PLANTATIONS

By F. H. EYRE

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A record of survival, even as long as five years after planting, is no criterion of the success or failure of a pine plantation in the Lake States. On sites favorable to aspen this species may enter later, and, through its greater aggressiveness, convert the stand to a mixed association, with the aspen having a larger basal area than the pine. Systematic care by periodic weedings and release cuttings is the only remedy to maintain the pine.

THE cut-over and burned-over pine lands of the Lake States present a reforestation problem of considerable magnitude. The problem is not only large but also difficult of solution. Not the least of the difficulties encountered in establishing and growing a new forest on such lands may be attributed directly to the competition of aspen and brush.

A study of three adjacent plantations of Norway and white pine, south of Birch Lake on the Superior National Forest, brings out strikingly the aggressiveness of aspen. These plantations, totaling a little over 100 acres,[1] were established in 1915 and 1917 on an area which is said to have supported originally a stand of some 50,000 feet, board measure, per acre of Norway and white pine. Following cutting the area was burned several times, the last fire being in 1914. The soil is a gravelly and sandy loam of good quality. The site and vegetative conditions, therefore, were apparently nearly ideal for starting a plantation of Norway pine.

One-year-old transplants were used for the 1915 planting and mostly 2-1 and 1-2 transplants for the later work. An approximate 8 x 8-foot spacing was adopted in both instances. The average cost of the 1915 planting was $14.29 per acre and for the 1917 work $13.27 per acre.

Annual examinations and counts were made by the national forest personnel for two or three years after the plantations were established. The records indicate that both plantations got off to a good start, each with a survival of better than 85 per cent the second year after planting.

In 1924 the Lake States Forest Experiment Station examined the area and reported a survival of 84 per cent for the 1915 and 62 per cent for the 1917 Norway plantations. It was first noted at this time that there was some competition from aspen, but it was not reported to be particularly serious.

It was quite obvious, however, when the plantations were again examined in 1931 by the experiment station that, during the seven years which had elapsed since 1924, aspen had become very aggressive. Large patches of aspen, which contained only a few stunted and suppressed pines, or none at all, were observed and much of the plantation where pine still survived was seriously in need of release cuttings.

A systematic survey, in which 10 per cent of the stand was covered, was undertaken to determine, if possible, what had taken place. Strips one-half chain wide were run at five-chain intervals through the plantations, heights of planted trees were measured with a pole, and both heights and diameters of aspen were estimated. Tally sheets were changed at the end of each chain so that each chain o

[1] 93.3 acres of Norway pine and 8.8 acres of white pine.

strip was essentially a one-twentieth acre plot.

Survival, as expressed by percentage of full stocking (680 per acre), was computed for each plot and then summarized for the whole plantation. The Norway pine plantation, which has been pointed to with pride as one of the oldest and best on any national forest in the region with an average survival in 1924 of 76 per cent, in 1931 showed but 51 per cent of living trees.

The drop in survival was greatest in the 1915 Norway pine plantation. This decrease from 84 to 48 per cent, with due allowance for differences in sampling, is so striking that a consideration of possible reasons for the change would seem worth while.

Site quality for aspen appears to have influenced survival. Although no appreciable difference in Norway pine site between the 1915 and 1917 planting was discovered, aspen was found to be consistently taller in the former, thus indicating a better site for that species. Basal area was likewise greater. Consequently, the 1915 plantation must have suffered from more severe competition from aspen than did the 1917 plantation.

The white pine had 61 per cent survival in 1931. But, because of slower juvenile growth and because many trees have been repeatedly damaged by rabbits, it does not make as good a showing as the Norway. Its greater persistence and tolerance probably account for its greater survival.

Survival, however, does not tell the whole story. The plantation might indicate fairly good survival, as in the case of white pine, and still be poor because of the small size of the pines as compared to the aspen. Consequently, the plots were grouped arbitrarily according to stocking of pine as expressed by basal area.

When grouped in this way, only 19 per cent of the two Norway pine plantations may still be classed as Norway pine. Thirty-five per cent of the area is a mixed forest in which Norway pine maintains the ascendency, 20 per cent is of mixed composition in which aspen has a greater basal area than pine, and 26 per cent has actually reverted to aspen and brush.

From the point of view of stocking as expressed by basal area, the Norway pine is more successful than the white pine plantation in which pine predominates on only 42 per cent of the planted area.

Height measurements also bring out the effect of aspen competition on the planted pines. Analysis of plot data for the 1915 plantation shows that where Norway pine is still pure, the average height of the pine is 18.7 feet. Where the plantation is of mixed pine and aspen composition, the pine averages 17.2 feet tall; and where the aspen has control of

TABLE 1

COMPOSITION—NORWAY PINE PLANTATIONS, 1915 AND 1917 COMBINED

Composition	Basal area of pine in per cent of total stand[1]	Area	
		Acres	Per cent
Pure Norway pine	90 - 100	17.8	19.1
Norway pine—aspen	50 - 89	33.0	35.4
Aspen-Norway pine	10 - 49	18.3	19.6
Aspen	0 - 9	15.5	16.6
Brush (hazel and alder)	- -	8.7	9.3
Total	-	93.3	100.0

[1]The basal area not made up of pine consists almost entirely of aspen. However, a small percentage of the total stand is made up of large-tooth aspen, paper birch, bur oak, and jack pine. A very few natural seedlings of white pine are also present.

the site, the pine is but 9.3 feet tall. (Table 2.) The 1917 Norway white pine plantations indicate a similar trend.

The crowding effect of the aspen upon the pine is emphasized still further by a study of crown classes. In the mixed types, where aspen has entered the picture, there is a distinct differential in crown classes present. Of the surviving Norways in that part of the mixed stand where Norway pine still has the supremacy, 29 per cent are either intermediate or suppressed trees. Where aspen has the larger basal area, over half of the planted pines are in the lower crown classes. What few pines remain under the pure aspen are practically all suppressed. In contrast to this, natural suppression is scarcely apparent at all in the pure Norway pine.

The data quite conclusively show that the plantations have regressed. The number of planted pines is yearly decreasing because of aspen competition. The basal area growth of the pine is not keeping up with that of aspen. There has been an appreciable loss in rate of height growth of pine and more and more pines are becoming suppressed. Yet, where the Norway pine has maintained itself against the aspen, exceptionally good growth has been made.

For example, the pure Norway pine in the 1917 plantation shows a mean annual height growth of 0.9 feet as compared to 0.3 feet, which is the average reported by Kittredge[2] for somewhat younger Norway plantations on similar soils throughout the region. Moreover, the average height growth here is better than the best reported by Kittredge, if cultivated soils be omitted. Barring accidents, this part of the plantation should produce an excellent stand of pine timber.

Good height growth has also been made in the mixed stand where pine still controls the site, but stocking is not nearly so good. It would seem likely that groups

TABLE 2

HEIGHTS AND BASAL AREAS OF PINE AND ASPEN BY COMPOSITION GROUPINGS

Plantation and Composition	Pine Height			Aspen Height		
	Dominant	Average	Basal area per acre	Dominant	Average	Basal area per acre[3]
	Feet	Feet	Sq. Ft.	Feet	Feet	Sq. Ft.
1915 Norway pine plantation[1]						
Pure Norway pine	19.5	18.7	31.22	24.5	20.2	1.66
Norway pine—aspen	20.0	18.3	24.80	29.5	25.5	11.28
Aspen—Norway pine	19.9	16.1	13.01	30.4	24.5	33.03
Aspen	--	9.3	4.76	37.5	29.6	52.81
1917 Norway pine plantation[2]						
Pure Norway pine	17.2	16.2	17.85	21.7	17.5	.85
Norway pine—aspen	17.2	13.4	13.44	26.8	21.6	5.95
Aspen—Norway pine	17.5	13.6	8.41	31.7	24.4	16.48
Aspen	--	--	--	--	--	--
1917 White pine plantation[2]						
Pure white pine	16.1	12.2	7.92	30.0	15.0	.56
White pine—aspen	14.6	12.2	7.81	24.8	18.6	2.56
Aspen—white pine	13.4	10.3	4.40	32.3	23.9	15.74
Aspen	12.0	9.3	.82	32.6	24.4	31.30

[1]19 years from seed.

[2]18 years from seed.

[3]Includes small numbers of other species.

[2]Forest Planting in the Lake States, U. S. D. A. Bulletin 1497, 1930, p. 50.

f pine in this area should survive against he competition. Considerable parts, however, probably will revert to pure aspen. The mixed stand, less than half of which is stocked with pine, is fast turning into an aspen forest. Even in this stand certain of the Norway pines, especially the dominant trees, should remain to make up part of the future forest. But where the pine comprises less than 10 per cent of the basal area, the situation is hopeless.

In other words, the pure Norway pine is doing exceptionally well as it is, whereas, the pine under pure aspen has practically no chance of life. Part of the mixed stand may amount to something if left alone, but on the greater part of this area, which constitutes 55 per cent of the total planted area, the pine is badly in need of liberation.

By all appearances, release cuttings or weedings should have been made at least five years prior to 1931. Yet, there is every indication that such cuttings, even though delayed, would still greatly benefit the stand. But if they are not made, there are bound to be further serious losses in the plantations.

In order to find out just what the liberation would cost and to study the effects at a later date, two types of release cuttings were tried out, approximately an acre being devoted to each. On one, the intermediate and codominant pines were released, but no attempt was made to release suppressed or badly injured trees. On the other, all aspen trees were cut which appeared to be crowding or suppressing any pine.

The first method of weeding removed 380 trees per acre, or approximately 40 per cent of the total basal area of the aspen and required three and one-half man hours per acre for the work. The second type of release removed 800 trees per acre, or nearly 90 per cent of the basal area of the aspen and required six and one-fourth man hours per acre for the work. The trees removed averaged about three inches in diameter in both cases.

The results of the cutting, on the basis of a rate of fifty cents per hour, indicate a cost of $1.75 per acre for the moderate weeding and $3.12 per acre for the heavy weeding.

After the survey data were all compiled it was found that the aspen necessary to be cut on the plots selected was considerably greater than that of the general average for all of the plantations. On the other hand, no time was allowed for supervision and marking and the work was probably done at a faster rate than could ordinarily be expected. Consequently, the figures may be fairly indicative of the costs of such work.

It must be left to future remeasurements to tell the effect of release cuttings. But, from the facts thus far obtained, certain conclusions which apply at least to northeastern Minnesota and probably to a considerably wider area can now be made:

1. Survival counts of pine plantations a few years after establishment, although they show the presence or absence of planted trees at the time, by no means indicate what will happen at a later date. Thus, such a record, even as long as five years after planting is done, is no criterion of the success or failure of the undertaking.

2. There is no guarantee that pine plantations with high initial survival even on sandy soils, but on which aspen will grow, will succeed unless systematically cared for by periodic weedings and release cuttings.

IMPROVING SEEDBED CONDITIONS IN A NORWAY PINE FOREST

By HARDY L. SHIRLEY

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Due to the mat of needles and surface vegetation common in pine forests of the Lake States, young pine seedlings often have great difficulty in becoming established. A disk-harrow was used to break up the mat and cultivate the soil just at the time the cones started opening. An excellent catch of seedlings resulted which exceeded by over ten times the numbers starting on untreated soil. The cost of such an operation, where it can be applied, should not exceed one dollar per acre.

IT IS of paramount importance in the handling of lands for forest production that a new crop of forest trees should immediately succeed the mature stand after logging. If this new crop can be started without artificial aid, it is called natural forest reproduction. Where natural reproduction has failed, the blame is generally placed upon the method of cutting the old stand. Natural seedlings, however, may or may not be found under mature pine stands of almost any density. It would seem evident, therefore, that some condition other than the upper canopy plays an important role in the establishment of pine seedlings.

In stands of virgin Norway pine on the Chippewa National Forest, Minnesota, there are many places where pine seedlings have not become established even though an ample supply of seed is produced by the old trees every few years. It is patent that artificial aid must be given to insure full stocking of these areas for the next forest crop. One of the most obvious treatments to remedy this situation appears to be cultivation of the soil at a time when an abundant supply of natural seed is available.

Cultivation of the soil for the reception of natural seed has been recommended and practiced in Europe for many years, and has also been recommended by such American writers as Toumey and Korstian (5) and Hawley (2). Broadcast sowing of white spruce seed on soil, which had been scratched up by dragging brush across it before and after seeding, was tried some years ago in a Norway pine stand at the Cloquet Forest Experiment Station, Minnesota. A thick stand of spruce seedlings resulted from this treatment; however, no subsequent trials of the method have been made.

The Stand

The stand treated is composed of mature Norway pine (*Pinus resinosa* Solander) located along the east shore of Twin Lakes on the Chippewa National Forest. This stand has been untouched by logging operations, except for the removal of dead and down trees. The trees average 200 to 280 years in age with diameters of 9 to 25 inches and heights of 80 to 98 feet. (See Figure 1.) A surface fire burned through the stand in 1918, evidently killing all but a few scattered clumps of the pine seedlings then on the ground. From 1918 until 1930 only an occasional new seedling had become established. Of 14 mil-acre quadrats distributed over the area only five had new seedlings. The soil is being rapidly encroached upon by alder (*Alnus incana* [L.] Moench.) and hazelnut (*Corylus rostrata* Ait.). (Figure 2.) Where these high shrubs are not present there is a rather dense mat of grass, sedge and low shrubs, chief of which are low bush blueberry, (*Vaccinium pennsylvanicum* Lam.); American twin flower, (*Linnaea borealis* L. var. Americana [Forbes] Rehder); bearberry (*Arctostaphylos uva*

rsi [L] Spreng); wintergreen (*Gaultheria procumbens* L.); and dwarf bush honeysuckle (*Diervilla lonicera* Mill.). The vegetation is more fully described in another paper, Shirley (4), which deals with the general region around Pike Bay and Cass Lake, of which the Twin Lakes area is a part.

Measurements by use of a thermopile, Shirley (3), of the percentage of total solar radiation penetrating the canopy were made at 128 spots distributed over the area treated. The results showed variations from 6 to 100 per cent of total sunlight with a mean of 48 per cent and a standard deviation of 3 per cent. It was found, Shirley (4), that 35 per cent sunlight is ample for the establishment of Norway pine reproduction; hence the failure of seedlings to become established on the area under consideration can scarcely be attributed to insufficent light.

Three plots were chosen for treatment, two of which adjoined one another while the third was some 300 feet distant. The three plots are essentially alike in density of overstory and character of undergrowth, including density of reproduction. The plots have an average stand of 6,000 cubic feet per acre with 83 mature trees. All three were comparatively free from high hazelnut and alder brush.

Seed Crop

Norway pine in northern Minnesota bore a moderately heavy crop of cones in the fall of 1930, which averaged about 11 ounces of seed per bushel. Cones from this region usually average 8 ounces of seed per bushel. The seed collected on the Chippewa Forest in 1930 showed germination as high as 95 per cent. The trees on the experimental areas apparently bore as well as the average for this year. The cones ripened and began opening at an unusually early date. An attempt was made to get an estimate of the number of seeds falling on the area by counting the seeds on burlap bags slit open and pegged out on the ground. Twenty bags, uniformly distributed, were visited every two or three days during the time of greatest seed fall. From September 15, when the first seed was found, until September 26 many seeds were recovered but only occasional ones thereafter. The total count showed the equivalent of 110,000 seeds per acre on Plot A and 75,000 on Plots B and C.

That only a small portion of the seeds falling were recovered soon became evident from the abundant signs of activity on the part of birds and mice. Ten white pine seeds were placed on each of the bags on October 14. Two days later only two seeds were recovered from the 20 bags, and these had been protected inside a fold. Red-backed mice (*Evotomys gapperi loringi* Bailey), white-footed mice (*Peromyscus maniculotus gracilis* Le Conte), song sparrows (*Melospiza melodia* Wilson), and white-throated sparrows (*Zonotrichia albicollis* Gmelin) were recovered from traps which were baited with pine seed during the summer of 1931. It is probable that many other birds, particularly finches, crossbills, and other sparrows consume large quantities of pine seed, especially during the migration period.

Cultivation

Cultivation[1] was done on September 6, 1930, with an ordinary weighted 5-foot disk-harrow having 16-inch blades and drawn by a 1¾-ton crawler-type tractor. Three degrees of cultivation were used. On Plot A the disk was run at approximately 15-foot intervals, which gave 5-foot strips of disked soil with 10-foot intervals between strips. On Plot B the entire area was cultivated once and Plot C was cross disked at right angles to the first disking. Disking on Plot A was done

[1]The necessary machinery and labor for carrying out the disking operation were furnished by the Supervisor of the Chippewa National Forest.

Fig. 1.—Mature Norway pine stand showing disked furrows in the foreground. Note the encroachment of alder brush in the background.

Fig 2.—Alder brush around the periphery of Plot A, along the edge of which counting spots were established.

at the rate of 1.1 acres per hour. Continuous disking, as carried out on Plots B and C, was accomplished at the rate of 0.81 acres per hour for once over the area.

The disk cut through the litter and surface vegetation quite effectively and exposed mineral soil in many places. It was not large enough, however, to turn under the sod and shrubby mat which covered the surface soil. On Plots B and C the tractor was first driven around the periphery of the area, then gradually progressed from the outside towards the center. Consequently the disk-harrow was drawn in curves, especially over Plot B. When rounding turns the implement makes wider furrows which are much less likely to close completely than the furrows made while driving straight. Accordingly, Plot B was in somewhat better condition for seed reception than Plot A. Cross disking worked the surface sod and litter up more thoroughly and left the soil in excellent tilth. However, it tended to fill up the narrow grooves which proved to be very favorable places for seedlings.

Counting Spots

In order to determine accurately the results of disking, 200 counting spots were distributed over the disked area of Plots B and C with an additional 200 scattered around their periphery on undisked soil. Since the disk was run close to the hazelnut and alder brush, most of these undisked spots were more or less shaded by the secondary canopy. Plot A had 100 spots on disked soil and 100 on the intervening undisturbed soil where they were free from the influence of a secondary canopy. The spots were established in pairs on both disked and undisked soil. On one of each pair 15 Norway pine seeds of 1929 collection, having a germination percentage of 73, were dropped. A painted lath, to which was tacked a zinc tag with embossed numbers, marked the center of each spot. A 46-inch metal hoop, area 0.000265 acres, was centered on the lath to delimit the periphery of the counting spot. The use of circular counting spots resulted in considerable economy in time and materials, since only the center had to be marked on the ground.

Results

When the area was visited in the late spring of 1931, Norway pine seedlings were coming up thickly wherever the soil had been disked. The seedlings were especially numerous in the bottoms of the narrow disk furrows where the seed was evidently protected to some extent from the ravages of birds and rodents. Wide furrows and large flat areas with mineral soil exposed had fewer seedlings.

The seedlings on each spot were counted on July 20 and September 2 of 1931, and on June 15 and October 10 of 1932. The results of the counts are summarized on a per acre basis in Table 1.

By the end of the second growing season, at which time it may be assumed that the seedlings were fairly well established, there was an average of 860 seedlings per acre on the undisked soil while on the disked soil there were 10,620, over 12 times as many. Of the 300 counting spots on undisked soil, only 42 had live seedlings at the end of the second year as contrasted with 209 on the disked soil. That soil cultivation was directly responsible for the increase in seedlings cannot be doubted.

The effects of different treatments on numbers of seedlings are made manifest in two ways: (1) their effect on initial establishment, and (2) their effect on subsequent survival.

The Effect of Soil Cultivation on Initial Establishment

The density of seedlings at the end of the first growing season is shown graphi-

cally for different treatments in Figure 3. The number of seedlings per acre increases consistently from the shaded undisked soil to the completely disked, with a decrease for the soil which was disked twice. The data were analyzed statistically to determine if the differences were significant. Probabilities, from Student's Table, Fisher (1), give odds of more than 99 in 100 that the differences were not due to chance, except for that between the disked at intervals and disked twice.

That a cover of hazelnut and alder proved less favorable for establishment than the low shrubs and grass is probably due in large part to less favorable seedbed conditions in the leaf litter. It is also likely that these spots received fewer seed since the tall shrubs were more profuse in the openings. One complete disking proved best of all. This seems unexpected until it is remembered that the most favorable place for seedlings was the bottom of narrow furrows. Working the soil more thoroughly tends to destroy the narrow grooves and leave smooth, bare soil surfaces which are subject to rapid surface heating and drying. Exposed mineral soil alone does not necessarily form a good seedbed. If loose soil were sufficient, pine seedlings should come up profusely in gopher mounds, but this very rarely happens. The advantages of the groove are four-fold. It tends to protect the seed from birds and rodents; in it the seedlings' roots get down into the deeper and more moist layers of soil, and are thus afforded protection against surface drying; it provides some shade for the young seedling against the desiccating action of direct sunlight; and it removes to some extent the competition of surface vegetation. Disking at intervals was less effective mainly because the disk did a poorer job on this area. It was drawn in straight lines on Plot A and in curves on Plot B.

Soil Cultivation and Survival

The same factors which favored germination also favored survival. The shade of tall shrubs appeared detrimental for survival during the first summer and winter, but during the second summer survival was better than in the unshaded area. The first year losses were probably caused by smothering with leaves while the improvement during the second year was probably due to more favorable moisture conditions.

Any amount of disking enhanced sur-

Table 1

Number of pine seedlings per acre 1931 and 1932

Plot — Treatment	Number seedlings per acre 1931 July 20	1931 Sept. 2	1932 June 15	1932 Oct. 10
B & C—Not disked, shaded with hazel and alder brush:				
Seeded	2,450	1,660	1,060	530
Not seeded	2,100	1,130	940	870
A—Not disked, not shaded:				
Seeded	4,750	4,150	4,150	1,510
Not seeded	2,700	1,960	905	530
A—Disked once at intervals (disked portion only):				
Seeded	18,050	14,600	9,950	5,250
Not seeded	16,750	12,600	8,970	5,000
B—Disked once completely:				
Seeded	21,700	23,200	21,300	14,900
Not seeded	22,250	22,300	18,660	15,600
B—Disked completely and cross disked:				
Seeded	17,400	17,300	15,650	12,380
Not seeded	14,950	15,500	14,590	10,610

vival and the more thorough the job the better the survival. Cross disking was somewhat more favorable than one complete disking in this regard and both treatments were better than disking at intervals. The important factor in improving survival was doubtless reduction in competition both above and below ground.

Supplementary seeding failed to cause a significant increase in the number of seedlings on disked soil. Seeding did cause an increase in seedlings on undisked soil that was statistically significant, but which was actually less than the increase on disked soil. It seems probable, therefore, that the 15 seeds dropped at each stake formed only a small portion of the total seed that fell. The increase in seedlings on seeded spots over unseeded spots forms a basis for calculating the chances that a seed may produce a seedling. This shows that on disked soil a seed has one chance in 35 of producing a seedling surviving the first summer while on undisked soil it has one chance in 50. This method of calculating odds is open to considerable question since there was no true measure of the actual number of seeds falling; however, the results seem to be in general accord with those on other artificially seeded areas.

Practical Application

A disk-harrow may be effectively used to prepare a seedbed for natural seed in pine forests where soil, topographical, and other conditions permit its use. Cultivation should be done in the autumn

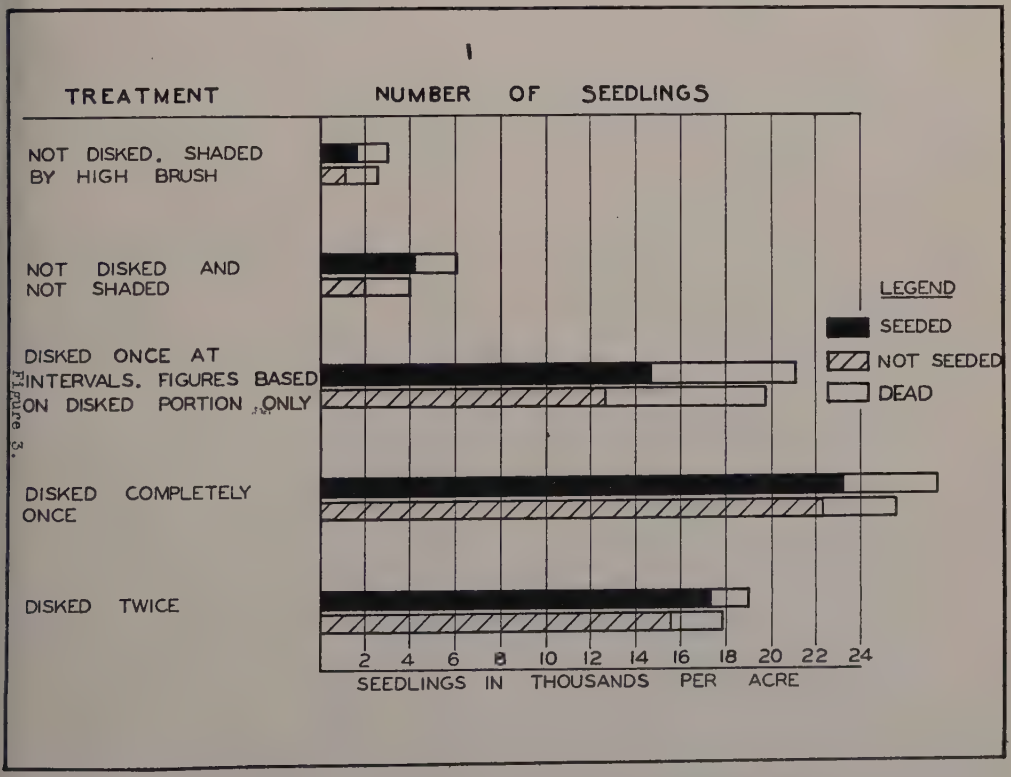

Figure 3.

Fig. 3.—Graphical presentation by treatments of the number of seedlings per acre surviving the first summer.

of a good seed year. Disking at intervals may be relied upon to give an adequate stand of seedlings in most cases. A 16-inch disk, heavily weighted, is well suited for the work provided it is sharp, but a 20-inch disk would probably work better.

While this study was conducted entirely in Norway pine forests, observation indicates that it would be equally successful in jack pine. In either type of forest it would probably be most successful to disk the soil some five years before removing the old stand so that an adequate number of seedlings will be on the ground at the time of cutting. Possible injurious effects to the old trees, due to cutting off their surface roots, were not observed even on the heavily disked plot. Since the summers of 1931 and 1932 were below normal in rainfall, it is doubtful if disking will result in the death of old trees. It may, however, reduce their rate of growth for a few years.

The cost of disking at intervals should not run over $1.00 to $1.25 per acre, and under very favorable conditions this figure can be considerably reduced. Complete disking, on the other hand, would cost about twice as much. Such an expenditure would not be justified unless it is shown that disking at intervals produces an inadequate stand of seedlings.

Summary

Three degrees of disking for preparation of a satisfactory seedbed were tried out in a mature Norway pine stand in a good seed year. All disking treatments produced over five times as many seedlings as the untreated soil. A single complete disking resulted in the establishment of more pine seedlings than disking at intervals or disking twice. Disking, by reducing the competition of surface vegetation and by allowing the seedlings to start in fresh mineral soil, greatly enhanced the chances of survival during the first two summers, which were below normal in rainfall. The most favorable places for seedlings were the bottoms of disk furrows where the seed received some protection from seed-eating birds and rodents. Here the seedlings were also afforded shade against excessive insolation and surface drying and some reduction in competition from surface vegetation. Shade of hazelnut and alder brush on untreated soil proved unfavorable for both germination and first year survival.

Supplementary seeding was of slight value on untreated soil and of doubtful advantage on cultivated soil when disking was done at the time of a good seed crop. From the records of sown seed it is estimated that on disked soil only one seed in 35 produces a seedling which survives the first summer, and on undisked soil only one seed in 50. The loss is attributed mainly to seed-eating birds and rodents. Provision against these losses must be made before direct seeding can be successfully accomplished where an abundant seed supply is not present.

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TEMPERATURE EXTREMES AS A FACTOR IN THE ECOLOGY OF THE SOUTHERN PINE BEETLE

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The effect of extremes of temperature on the abundance of the southern pine beetle is here reported. The factors considered were low winter temperature and high summer temperature. Low winter temperatures were often found to be associated with the termination of outbreaks of this insect. High summer temperatures were effective only in felled exposed logs during part of the summer.

THE widespread outbreaks of the southern pine beetle (*Dendroctonus frontalis* Zimm.) have been responsible for the destruction of more merchantable pine timber in the southern pine region than has any other agency. Because of the economic importance of this insect it has been the subject of more or less sporadic, but intensive, study for more than 40 years. Records of the occurrence of bark-beetle outbreaks made by A. D. Hopkins and other entomologists of the U. S. Bureau of Entomology, covering more than 30 years, indicate that these epidemics are characterized by a certain degree of periodicity. The determination of the factors responsible for the increases and declines in the numbers of these insects should be of great value in the application of control and preventive measures.

Many laboratory experiments on the effects of temperature on the development of certain insects have been conducted by entomologists and ecologists. Probably because of the difficulty of measuring this factor, and of determining its relative importance under field conditions, comparatively little information which can be applied to control problems has been gained. The recent publications on the effect of temperature on the seasonal appearance of the codling moth (2) and the application of extremes of temperature in the control of bark beetles (5) are outstanding exceptions.

It is known that extremes of temperature are important limiting factors in the development of many forest bark beetles. This paper represents the results of a 3-year field study of the effects of extremes of temperature on broods of the southern pine beetle, with special emphasis on low winter temperatures. The study was conducted as one phase of the investigation of the biology of this insect, carried on by the Bureau of Entomology since the establishment, in 1925, of an insect field station at Asheville, N. C.

The writer's observations over three successive winters on overwintering broods of the southern pine beetle have indicated some of the temperatures fatal to the different brood stages of this important forest-insect pest, as well as their effect on the subsequent beetle population. As these studies were confined almost entirely to broods under natural field conditions, it has not always been possible to separate and evaluate the various controlling factors. For example, the part played by parasites and predators has not been determined. Wherever possible, temperature and moisture records have been taken in the field to supplement examinations of the brood.

Climatic Conditions of Area Studied

The winter seasons in the area studied are characterized by numerous periods of warm weather, during which the south-

ern pine beetle becomes active and feeds, frequently followed by cold spells which result in high brood mortality, thus acting as a very effective natural control of this species. There were two such cold periods during the winter of 1926, the temperature in the first dropping to 10° F. and in the second to 2° F. The remainder of the winter was less severe and there were several warm periods during which the insects became more or less active. In 1927 there were two distinct cold periods, when the temperature fell to 10° F. and —5° F., respectively. The remainder of the winter weather was typically mild. The winter of 1928-29 was mild with fairly constant moderate temperatures, 17° F. being the lowest recorded.

Life History and Habits of the Southern Pine Beetle

The southern pine beetle may pass the winter in any stage of its development—as eggs, larvae, or parent adults within the cambium, or as mature larvae, pupae, or new adults in the outer bark. Feeding and development proceed during warm periods in the winter much as during the summer, but the development is slower.

There are usually from three to five generations a year, and under optimum conditions about 40 days is required for the development of a single generation. With the possibility of five generations a year and an increase of 1,000 per cent in a single generation, one can visualize the potentialities of this beetle and understand how it can change so rapidly during favorable years from an endemic to an epidemic status.

Relation Between Low Winter Temperatures and Beetle Mortality

Previous to the work of the writer, the only observations indicating that low winter temperatures resulted in mortality of overwintering broods of the southern pine beetle were those made by A. D. Hopkins (3) in 1893. In the spring of that year, on visiting an area in West Virginia that had been heavily infested the previous summer, he found only dead and decaying broods, and attributed this almost complete mortality to the severe freezes of the preceding winter.

Upon finding similar mortality in broods of this insect in the Pisgah National Forest near Asheville, N. C., during the winter of 1926-27 (1), the writer began a study of the effect of low winter temperatures upon the various overwintering stages. Prior to and following cold periods in the winter, samples of bark of shortleaf pine (*Pinus echinata*) and pitch pine (*Pinus rigida*) were shaved up and examined for the presence of brood. The results showed a preponderance of larvae, indicating that a large proportion of the insects overwinter in this stage. There was also a marked difference in the resistance to cold shown by the four brood stages. The thin bark of the second-growth pines used in the tests offered little protection to the hibernating broods, since low temperatures for short periods were almost as effective as those of longer duration.

Effect on Eggs

The egg stage was found to be the most resistant to cold of all the brood stages. Field temperatures of —5° F. did not appear to affect the eggs adversely. Eggs brought into the laboratory after exposure to this temperature were removed from the bark and placed on moist blotting paper. All the eggs hatched within one week, and the resulting larvae showed no ill effects from the exposure. Eggs left in the field following a similar cold period also hatched, and development of the larvae proceeded during the warm weather that followed. In spite of this resis-

ance of the eggs, however, the small number of broods which overwinter as eggs eliminates the likelihood of survival of large numbers of these insects in this stage.

Effect on Larvae

Air temperatures as low as 10° F. for short periods resulted in heavy larva mortality. In one field test, in which 2,326 larvae were counted on 12 square feet of infested bark, 43 per cent of them died at this exposure. It is significant, however, that all the mortality occurred in that portion of the brood occupying the phloem or inner bark. There are two explanations for this. In the first place, the comparatively high percentage of moisture in the phloem undoubtedly affects the brood in this situation, both directly through contact and indirectly through their feeding on moist food material. Furthermore, inasmuch as broods in the inner bark are usually in the active feeding stage, they are probably more easily affected than prepupal larvae in a hibernating or dormant state, which are more often found in the outer bark.

Moisture determination of phloem, in which larvae died at air temperatures of 10° F., were made and compared with moisture determinations of the outer bark, in which larvae suffered no mortality at the same air temperature. Phloem was found to contain consistently over 200 per cent of moisture, computed on the dry-weight basis, whereas the outer bark showed an average of less than 30 per cent. (Table 1.)

It seems probable that the difference in mortality of larvae in cortical and in subcortical situations lies in the moisture content of the bark and in the immediate previous history of the larvae. Larvae situated subcortically have been feeding, their moisture content is probably higher than that of larvae in the outer bark, and much free water occurs in their immediate environment. They have been more protected from cold and therefore have not become hardened to it, either through the emptying of their alimentary canals or by loss of water. On the other hand, the insects present in the outer bark are inactive, their surroundings are dry, and they may have become hardened to cold. In any event, southern-pine-beetle broods in the outer bark do not encounter temperatures fatal to them while the temperature of the air remains as high as 10° F., whereas all those in the inner bark are killed at this air temperature. Just what percentage of the entire brood is thus affected by such temperatures it is difficult to say, but it is not uncommon to find infested trees during early winter with 50 to 75 per cent of the brood occupying the inner bark.

Temperatures of —4° and —5° F., even for very short periods, were found to be fatal to practically all the larvae, whether in the outer or the inner bark, and whether feeding or dormant. One hundred per cent mortality was obtained at —5° F.

Further support for the theory that moisture lowers the resistance of overwintering broods is given by Miller (4), who found that in the case of the western pine beetle (*Dendroctonus brevicomis*

Table 1

MOISTURE CONTENT OF INNER AND OUTER BARK TAKEN AT DIFFERENT HEIGHTS ON AN INFESTED PINE FOLLOWING A PERIOD WHEN THE AIR TEMPERATURE FELL TO 10° F.

Height of sample on tree	Moisture content of bark		
	Outer bark	Inner bark or phloem	Difference
Feet	*Per cent*	*Per cent*	*Per cent*
3	27.1	210.7	183.6
5	29.3	205.0	175.7
10	28.8	202.2	173.4
15	32.0	278.5	246.5
20	27.3	228.0	200.7
Average	28.9	224.8	195.9

Lec.), an insect similar to the southern pine beetle, brood mortality occurred at higher temperatures in saturated than in dry bark.

Effect on Pupae

Pupae have occasionally been found to withstand more severe freezing than has any other stage of the insect. While some mortality has been found at zero temperatures, there has been a survival of 10 per cent at the lowest temperatures obtained in the field, viz., at —5° F.

Effect on Adults

Adult beetles were found to react to severe freezing very much as did the larvae. There was a very heavy brood mortality of this stage beginning at about 0° F. One hundred per cent mortality was obtained when field temperatures were as low as —5° F. for a short time. The fact that pupae and adults always hibernate in the dry outer bark, and never in the moist inner bark, probably saves many of them from death during moderately cold periods.

Protection to Broods Offered by Fallen Logs

Occasionally broods of the southern pine beetle are unaffected by low winter temperatures. For the most part such broods are found in a narrow strip of bark on logs lying in contact with the ground. It is therefore advisable to clean up the large logs and tops found in slash areas after logging, so that there will be no possible place of protection for overwintering broods.

Relation of Temperature to Past Outbreaks

During the winter of 1926-27 and again in 1927-28 temperatures as low as —5° F. were encountered, which destroyed practically all the overwintering broods of the southern pine beetle except those in the egg stage and a few of other stages in well-protected places. As expected, but few beetles were in evidence following these two winters. However, the winter of 1928-29 was comparatively mild, 17° F. being the lowest temperature recorded. As a result the beetles in all stages overwintered successfully in standing trees as well as under protected conditions such as in fallen logs, and a heavy beetle emergency occurred during late April and early May. Apparently there had been no brood mortality as the result of low temperatures during the entire winter.

It is significant that all past outbreaks of this beetle that have occurred in the State have followed a succession of mild winters when no fatal low temperatures were recorded. It is also significant that many severe outbreaks have been terminated by cold winters. Minimum temperatures from nine stations in western North Carolina from 1890 to 1925 (Table 2), when correlated with activities of the southern pine beetle in this region, indicate the importance of low winter temperatures in holding this pest in check.

The abrupt ending, in 1893, of the great West Virginia outbreak of the two preceding years has already been mentioned (3). Little is known of the extent or duration of this outbreak in North Carolina, but it is believed to have reached this area. The extremely low temperatures occurring in 1893 over the entire Appalachian region undoubtedly reduced overwintering broods of the southern pine beetle to a minimum.

No outbreaks were reported from 1894 to 1901, and the temperatures as recorded from nine North Carolina stations during these years were unfavorable for them.

A local outbreak was reported in west

ern North Carolina which lasted from 1902 to 1905. Favorable temperatures occurred generally over the region during 1902 and 1903, followed by very unfavorable ones during 1904 and 1905, which possibly checked the outbreak. In April, 1906, practically no living beetles could be found.

A general outbreak in western South Carolina, reaching a climax in 1911, has been reported as disappearing in 1912. This outbreak extended into western North Carolina and northern Georgia, but was intensively studied at Spartanburg, S. C., a station less than 15 miles south of the North Carolina line and included in the same area from which the temperature records were taken. The temperatures at the more southerly stations of Brevard and Hendersonville are indicative of conditions existing over much of the area covered by this outbreak. An examination of the brood at Spartanburg in the summer of 1912 showed that it died out just as suddenly as did the outbreak of 1892. It is believed that the widespread and extremely low temperatures occurring in January, 1912, were of primary importance in checking the outbreak.

From 1913 to 1916 an outbreak of the southern pine beetle occurred in the Unaka National Forest in Tennessee and Virginia. This forest also extends into western North Carolina and is similar in elevation and character to the Pisgah National Forest, so that a record of minimum temperatures in one section should indicate conditions in the other. The records indicate that mild winters occurred during 1913 and 1915, and that unfavorable low temperatures occurred during 1914 and 1916, especially in the latter year. The control work in the area studied may have overshadowed the effects of low temperatures; however, the outbreak ceased during 1916.

For several years preceding 1921 practically no reports of the occurrence of the southern pine beetle were received anywhere in the South. A study of the minimum annual temperatures during this period may help to explain the absence of beetle outbreaks. The winter of 1917 was the coldest since 1899, with subzero temperatures throughout practically all the area covered by the southern pine beetle. The following winter was also very severe, and those of 1919 and 1920 were too cold to permit survival of a high percentage of overwintering broods. However, 1921, 1922, and 1923 were very favorable to overwintering broods, and a general epidemic occurred during 1922 and 1923. This outbreak practically disappeared during 1924, and the low temperatures during January of that year were probably the chief factor contributing to the death of the beetles. Unfavorable temperatures following 1924 kept the number of beetles at a minimum in the Appalachian region until 1929.

Low temperatures are not responsible for the termination of all outbreaks of the southern pine beetle. In some sections where outbreaks occur fatal lows are never experienced. They are, however, believed to be the most important single limiting factor in the area most seriously affected by this insect.

Relation Between High Temperatures and Beetle Mortality

That high temperatures are important in the artificial control of some bark beetles is well known (6). General observations indicate, however, that, in the case of the southern pine beetle in standing trees, summer temperature is probably not a limiting factor. The fact that subcortical temperature of felled logs lying in direct sunlight often rises considerably above that of the surrounding air has, nevertheless, often been made use of in

TABLE 2

MINIMUM TEMPERATURES FOR NINE STATIONS IN NORTH CAROLINA FROM 1890 TO 1925

Station	Minimum temperature (degrees Fahrenheit)																	
	1890	1891	1892	1893	1894	1895	1896	1897	1898	1899	1900	1901	1902	1903	1904	1905	1906	1907
Asheville	11	13	4	–9	–3	–9	4	–2	4	–10	0	5	9	5	4	–6	7	16
Brevard	—	—	—	—	—	—	—	—	—	—	—	—	8	5	–3	–5	8	6
Hendersonville	—	14	—	—	—	—	—	—	—	–9	–1	–2	8	6	–8	–3	6	10
Lenoir	18	15	10	–15	1	0	4	0	7	–8	—	–9	9	9	5	2	10	11
Highlands	4	4	8	–7	–10	–17	–5	–10	–2	–19	–6	–5	3	–2	–8	—	—	—
Hot Springs	—	—	—	—	—	—	—	—	—	—	—	—	11	9	12	–4	8	18
Morganton	17	12	14	–1	8	0	8	5	7	—	—	–4	10	10	4	2	9	14
Waynesville	—	—	—	—	—	—	—	—	—	–14	0	–3	6	6	4	—	4	11
Mount Airy	14	12	—	–15	5	–1	3	1	6	–1	2	6	10	10	1	—	9	11

Station	Minimum temperature (degrees Fahrenheit)																	
	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925
Asheville	5	2	10	10	0	15	4	18	6	–5	–2	0	4	20	12	6	–5	0
Brevard	–1	2	–1	11	–3	12	–2	12	–4	–12	–6	–4	1	17	12	8	–1	–2
Hendersonville	1	5	8	12	0	15	2	14	9	–4	–3	1	6	18	10	6	–3	0
Lenoir	0	4	8	14	2	—	5	17	–2	–18	–6	6	–1	14	13	9	2	1
Highlands	—	–4	2	5	–3	11	3	11	4	–12	–11	–6	–6	11	5	—	–7	–2
Hot Springs	14	3	11	11	1	14	6	17	0	–12	1	4	2	22	6	8	2	2
Morganton	1	9	11	15	2	17	7	15	4	–10	0	8	3	18	16	11	3	5
Waynesville	1	–4	–3	9	–7	9	–1	7	6	–4	—	—	–2	16	—	—	–4	–2
Mount Airy	–4	7	10	15	–1	12	6	15	2	–9	–2	9	3	13	9	—	1	5

control projects against the western pine beetle.

Tests made late in June, 1928, comparing the subcortical temperatures of beetle-infested logs with the air temperatures, give some idea of the possibilities of this method when applied against the southern pine beetle. Preliminary examinations showed that brood mortality in infested logs was high. For more accurate data an infested shortleaf pine of about 15 inches d.b.h. was felled and sectioned in blocks about 15 inches long. These blocks were numbered and placed in a shady spot, whence they could be easily transferred to the sunlight and subjected to high temperatures for any desired time and then returned to the shade. Several series of tests consisting of six blocks each were run with five thermometers placed in as many positions in each exposed block. Check blocks, also containing thermometers, were carefully protected from high temperatures. Brood counts were made immediately after the exposure to high temperatures.

It was found that when the inner bark reached a temperature of 100° F. for even a very short time, some of the larvae and pupae of the southern pine beetle were killed. At about 105° F. over a period of an hour about half the brood died, and at 110° F. or over all pupae and larvae died almost immediately. Adult beetles seemed to be more resistant to the heat than the immature forms, but a temperature of 112° F. was sufficiently high to kill practically all the adults within an hour or two. During clear, sunny days exposed logs reached killing temperatures when the temperature of the air was 70° F. In full sunlight the subcortical temperature was 25 to 35 degrees higher than that of the air. Exposure for an hour or more during the hottest part of the day was sufficient to kill broods in the upper sides of the logs. The width of the strip exposed to fatal temperature on logs lying in a north and south direction indicated that exposure for a day, during which time the log was turned, would result in killing of the brood in the entire log.

It was found that in the vicinity of Asheville, N. C., critical temperatures could be obtained on logs in the open only during part of the summer.

Summary

The lethal effect of low winter temperatures on broods of the southern pine beetle over a large part of its natural range has been under observation for three successive winters.

Low winter temperatures result in the death of many of the overwintering brood. Air temperatures of 10° F. cause almost complete mortality of brood overwintering in the moist phloem between the bark and the wood.

Subzero temperature is usually fatal to all stages of the southern pine beetle except the egg stage. Eggs withstand air temperatures of —5° F. Occasionally pupae survived this same extreme cold.

Mature adults and larvae are more easily killed by cold than inactive prepupal larvae, pupae, and young adults.

Since most of the young overwinter as larvae, there is a very high brood mortality beginning somewhere between 10° and 15° F.

Because of the thinness of the bark of shortleaf and pitch pines, especially the second growth, it is believed that it does not offer much protection for the hibernating brood. Temperature drops for a single night appear to be as effective as continued low temperatures.

During severe winters some of the brood overwinters successfully. The survivors are scarce, however, in regions where zero temperatures are recorded, and consist of protected individuals on the

bottom of logs and large slash, where the temperature is modified by radiation from the soil, and of a few eggs that may not have hatched previously.

High summer temperature has not been found to be a natural limiting factor. The broods develop over a wide range of temperatures, and in standing trees this development proceeds rapidly during the entire summer.

However, in felled logs exposed to the sun during the summer months subcortical temperatures as high as 112° F. occurred, which produced complete mortality of the brood. During clear, sunny days exposed logs reached this subcortical temperature when the air temperature was between 70° and 80° F.

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ANNUAL MEETING OF DEUTSCHER FORSTVEREIN

By WARD SHEPARD

Fellow, Carl Schurz Memorial Foundation

The author, a former officer in the U. S. Forest Service, gives his impressions of a meeting of the German Forestry Society. He was impressed by the change of German forestry from clear cutting to natural reproduction, the development of forest tools and machinery, the rapid development of wood-gas motor trucks and busses, the liberality of the Society toward admitting non-technical members, (it has 8,000 members compared to 1,950 for the American Society) and finally the fine professional and personal qualities of German foresters.

SOME six hundred German foresters assembled early in September in the beautiful city of Stuttgart, in Württemberg, for the annual meeting of the Deutscher Forstverein; and it was my privilege to be there as a representative of the Society of American Foresters and Fellow of the Carl Schurz Memorial Foundation. The attendance this year was unusually small, owing to the unsatisfactory economic conditions in Germany. With a total membership of over 8,000, the Forstverein usually has an attendance of 1,000 or 1,200 at its annual meetings; but even with the reduced attendance, the meeting was impressive and enthusiastic.

The subject-matter covered in papers and in field excursions was so rich and varied that I can give only a very brief report on a few major points of interest.

Germany is so rich in forestry technique that the principal emphasis of the Forstverein meetings is laid on field excursions, which in this case occupied four and a half of the seven days of the meeting. With the large number of people to be handled, one can readily realize that success depends on good organization; and here, as in all sorts of other activities, the native German genius for organization is very apparent. No less than fifteen different excursions (mostly day-long and the most important repeated on two successive days) were available to choose from; and these excursions were handled on schedule and under skilful and carefully prepared leadership. We travelled in large open omnibuses—a much cheaper, surer, and pleasanter method of field excursions than by means of miscellaneous private cars.

One of the notable excursions was that to Gaildorf, to see a significant and beautiful new development in German silviculture, the so-called *Blendersaumschlag* developed during the past 25 years by Professor Wagner, now of the forest school of Freiburg. As is well known, there was a considerable period in German silviculture dominated by a concept derived from agriculture—namely, growing pure crops of one species, such as spruce or pine, and reproducing by clear-cutting and planting, just as wheat or corn are grown under pure culture and are clear-cut and replanted. This concept, when applied to forestry, has pretty much broken down in Germany, owing to the bad effect of pure culture on the soil, on the quality of timber, on big game and wild life, and on the æsthetic value of the forest. Professor Wagner's teaching and practice have had a large influence in reinstating the silviculture of natural reproduction.

So lively is the interest in this problem that more than two hundred foresters visited Professor Wagner's revier in the estate of Count von Pückler-Limburg. In a great variety of mixed and pure stands of spruce,

fir, and beech, Professor Wagner has for many years been developing striking results with the new silviculture. Briefly the Blendersaumschlag system consists of successive cuttings (usually two or three cuttings in a period of from three to ten years) in a narrow fringe about 100 feet wide along the edge of the forest, the direction of the cutting being adjusted to the topography, wind-direction, and light. Only part of the timber is cut in one or more seeding cuttings, and when reproduction is firmly established in the partial light, the rest of the stand is removed. Meantime the next strip has already had its preliminary seeding cutting, and so the cutting progresses by successive waves or fringes, with resultant waves of reproduction sloping like a roof from the older to the younger. Any number of strips can be simultaneously operated in a given forest. The object is to afford optimum conditions of light, moisture, and wind-protection for reproduction.

Dr. Wagner is hailed in Germany as one of the masters of forestry, and his work is having a great influence in the conversion of German silviculture from pure cultures to methods of natural reproduction.

Another notable new silviculture that was the center of a popular excursion is the Keilschirmschlag (wedge shelterwood system) developed with brilliant success by Dr. Philip, formerly chief of the Baden State Forest Service. Here the cuttings, in the form of parallel wedges, have given extraordinarily fine natural reproduction of many species in mixture, including American white pine and Douglas fir.

There were many other excursions to state, communal, private, and farm forests, each skilfully conducted by a specialist; each a tribute to important and original work by men who may have devoted half their lives to working out a new idea in the woods.

Space forbids discussion of the numerous technical papers presented. But one other phase of the meeting I must briefly discuss because it is satisfying a forestry need that well deserves more intensive attention in America—the development (or rationalization) of forest tools and machinery. The Forstverein is coördinating and stimulating this work by studying needs and furnishing ideas and often designs to competing manufacturers. Thus, at this meeting were shown motorized machines, developed at the instigation of the Verein, for spraying trees with powdered arsenical compounds that kill the deadly nun-moth but do not injure higher forms of animals. Also were shown log-wagons equipped with specially designed balloon tires, which permit a team of horses to draw ten cubic meters of wood on a bad road instead of four. There was even a wheel-barrow equipped with a balloon-tire, which in contrast with the ordinary wheelbarrow quickly demonstrated that a man can push a much heavier load with such a tire and that rubber is cheaper than human energy. Another exhibit was a logging tractor the wheels of which were fitted with long spikes for soft or slippery roads, but which can be demounted in a few seconds for hard roads. Most significant of all are the rapid developments in wood-gas motor-trucks and busses, which in Germany are now being operated for one-sixth the fuel cost of gasoline driven vehicles, and which in America, with its cheaper gasoline, would still probably save three-fourths of the fuel costs.

The Forstverein is much more liberal than our own Society in admitting non-technical members; and has on its rolls large numbers of forest owners, leaders in the forest industries, and officials of many private and semi-public agencies concerned with forestry. Many of these members were present and took an active part in the meeting.

Most of all was I impressed with the fine professional and personal qualities of German foresters. They are highly trained, admirably equipped technically, and thor-

oughly devoted to the cause of forestry. They are delightfully friendly and cordial. I urge any of my colleagues who may be coming to Europe by no means to miss Germany. They will be many times repaid by the rich and vital technique of German forestry and by a delightful personal experience.

It was my privilege to address the Verein and to convey to it the warm and cordial greetings and good wishes of the Society of American Foresters.

Wood Transport

Wood transport in the mountains of Austria is very highly developed mechanically, especially slides, flumes, and overhead cableways. Foresters who are interested in this phase of logging (and can read German) will be interested in a new Austrian book just in process of publication, entitled "Riesanlagen und Seilbahnen" ("Log Slides and Cableways") by Professor of Engineering Dr. Leo Hauska and Privatdozert Dr. Julius Duhm, of the Hochschule für Bodenkultur, Vienna. This book of 320 pages, with 150 illustrations and drawings, deals with every phase of the scientific construction and operation of these logging devices. The price is 28 Austrian schillings (approximately $3.92 plus 50 cents for postage). It can be obtained through professor Hauska.

Ward Shepard.

BRIEFER ARTICLES AND NOTES

Weight of Fruit of Nuttall's Oak

Since the detailed description of the species *Quercus nuttallii* in 1927 by E. J. Palmer of the Arnold Arboretum, Jamaica Plain, Massachusetts, in the *Journal of the Arnold Arboretum*, Volume 1, the frequency of occurrence and the importance of this species in the Mississippi Delta region have been repeatedly observed. Its rapid growth rate, when considered with its abundance and the quality of its wood for commercial uses, gives this species an importance enjoyed by a few in the Delta hardwood region. In recognition of these considerations, one forest nursery is furnishing planting stock of this species. Owing to its aggressive reproductive ability in its native environment, artificial reproduction can not be expected in the immediate future. However, available information concerning seed and fruit weight is desirable. The following data are based on weighings of fruits and nuts from the seed crops of 1931 and 1932 collected from trees of *Quercus nuttallii* in northern Louisiana and northern Mississippi. There is a considerable amount of variation in the size of fruits of this species, and although a fair range of fruit sizes is thought to have been obtained, no pretense to absolute accuracy is made. The fruit crop of this species has been attacked by larvae belonging probably to the genus *Balaninus*. Although all nuts known to have suffered larvae damage were eliminated from weighings, it is entirely possible that some were unknowingly included. Samples referred to below were picked at random from a container filled with fruits.

Weight of 300 acorns (samples 1, 2, and 3 of February 23, 1932), 1,526.9 grams; Weight of 354 acorns (samples 1, 2, and 3 of November 19, 1932), 1,335.6 grams; Total, 2,862.5 grams.

Average weight per 100 acorns, 437.69 grams, or .9649 pound.

One pound of acorns, without cups, contains 103.6 fruits.

Weight of 100 acorn cups (average of 200) = 87.8 grams, or 0.1936 pound.

One pound of acorn cups contains 516.5+ cups.

Robert K. Winters,
Southern Forest Experiment Station.

A Hybrid Oak With Forestry Promise

Kettle Springs Flat on the Mont Alto State Forest in southern Pennsylvania is a locality where forest fires have occurred frequently during the past century or two. The original growth was typical mixed oak and chestnut forest with scattered pitch pines. Scarlet, rock and scrub oaks are the hardwoods predominating now, with scrub oak holding more than half the terrain since the bark disease reduced chestnut to the status of a shrub. Here on an area of about ten acres occur ten clumps and one individual tree of very aggressive hybrid oak, which by its characteristics and the neighboring trees is probably x *Quercus robbinsii* Trelease, supposed to be a cross between *Q. ilicifolia* Wang. and *Q. coccinea* Muench. and reported in the Check-list by George B. Sudworth from Bristol County, Massachusetts.

This oak has the ability to send up root suckers when cut or killed back to the ground by fire. It shows here from one up to 34 good stems per clump. In this last case, these stems all occupy an area of less than 300 square feet. They are 20 feet tall by 1.7 inches in diameter breast high, and very uniform. The average number of stems per clump is 10, with a height of 18 feet, while the scrub and scarlet oak specimens growing nearest average respectively 7 and 20 feet. The last fire burnt over this area 17 years ago and killed everything except a few pitch pines.

This hybrid is not, as a rule, quite so good in form as the scarlet oaks growing nearby, but it is more thrifty, and during the current season (1932) its foliage escaped injury from the mites which distorted or killed many of the scarlet oak leaves. It may not grow to good saw timber size, but it will produce a heavy stand of good fuel-wood and mine timbers, and has the following definite advantages: (1) It is actually propagated by fire, (2) It seeds almost as heavily, frequently, and early in life as its inferior parent, (3) The acorns are of such size as to be suitable food for wild turkey, pheasants and other game, (4) It is very modest in soil requirements.

GEORGE S. PERRY,
Penna. Forest Research Institute,
Mont Alto, Pa.

COMPARATIVE RADIAL GROWTH OF VARIOUS OAKS[1]

Diameter growth rate varies among species and between trees of the same species on different sites, in different age or diameter classes and in different crown classes.

This paper gives data showing variation in diameter growth between five species of oak. The data were collected while making a growth and yield study of the oak forests of Pennsylvania. Increment cores were obtained on over two hundred plots throughout the state. These cores, preserved in kerosene, were brought into the office for measurements. The number of annual rings in the last half inch and last inch of radius, and the width of the last ten and twenty annual rings were measured. The cores were primarily obtained to ascertain stand age and were taken only from healthy dominant or co-dominant trees. Thus the data reflect only the radial growth for the most vigorous trees in the stand. All trees were given a site index number corresponding to that of the plot on which they occurred. The data then were sorted on a basis of good and poor sites, and were averaged by diameter classes.

Table 1 shows the variation in width of the last ten annual rings. On the better sites, black oak leads in growth rate, followed by red, scarlet, white and chestnut oaks. On the less productive sites, red oak grows more rapidly until it attains a size of about ten inches d.b.h., when black oak begins to exceed it. The growth rate of scarlet oak could not be projected past the nine-inch class because of insufficient data, but the trend of its curve indicates that it, also, would exceed red oak at the same time. The ranking of white and chestnut oak on less productive sites is the same as on good sites.

In the nine-inch class, the difference in width of the last ten rings of red and chestnut oak is 0.28 of an inch; this is equivalent to a growth rate for red oak of about 35 per cent in excess of that of chestnut oak. This comparative value is about the same on the poor site. In the

[1]Contribution from the Department of Forestry, The Pennsylvania State College, State College, Pennsylvania. Publication authorized by the Director of the Pennsylvania Agricultural Experiment Station as Technical Paper No. 571.

smaller diameter classes and on the poorer sites the comparative growth rate is much greater.

Data are not available on the growth rate of trees in the intermediate or suppressed classes. Observation indicates, however, that the same relative values hold.

Red, black and scarlet oak belong to the black oak group. The growth rate of this group exceeds that of the white oak group, which includes white and chestnut oak.

A. C. McIntyre,
Penna. State Forest School.

Japanese Chestnut in New Jersey

The annual examination of the Japanese chestnut plantations in North Jersey was made during July, and in South Jersey

Table 1

WIDTH OF LAST 10 ANNUAL RINGS IN TREE RADIUS

Tree diameter at breast height Inches	Red oak	Black oak	Scarlet oak	White oak	Chestnut oak
		Width of 10 rings, inches			
		Good site			
3	0.93	—	0.89	0.81	0.92
4	.90	—	.85	.77	.84
5	.88	1.03	.81	.72	.75
6	.85	.94	.77	.68	.67
7	.82	.86	.73	.63	.59
8	.80	.81	.71	.60	.53
9	.78	.77	.69	.58	.50
10	.76	.75	.68	.56	.49
11	.75	.73	.68	.56	.48
12	.75	.74	.69	.57	.48
13	.75	.75	.70	.59	.48
14	.76	.78	.71	.61	.48
15	.77	.83	.73	.63	.48
Basis number trees	213	278	383	218	170
		Poor site			
3	0.84	0.72	0.60	0.50	0.44
4	.82	.70	.61	.50	.44
5	.79	.69	.62	.50	.44
6	.77	.68	.63	.51	.45
7	.74	.67	.64	.51	.45
8	.72	.66	.65	.51	.46
9	.69	.67	—	.52	.46
10	.67	.68	—	.52	.46
11	.66	.70	—	.52	.47
12	.65	.72	—	.53	.47
13	.64	.74	—	.53	.48
14	.64	.77	—	.53	.48
15	.64	.80	—	.54	.48
Basis number trees	68	94	57	189	197

Editor's Note: In reply to an inquiry concerning the data the author replied as follows: "No statistical analysis was made of this data. This might have been undertaken even though the amount of data was considerable if the diameter group averages had not followed so consistently, no trouble being experienced in drawing smooth curves. I do not believe that any statement we might make concerning correlation would particularly help because the data, as stated, is confined to dominant and co-dominant trees and hence could not be used for growth values taking the stand as a whole. The data is significant, however, in comparing growth rate of the several species. It is true that very little difference occurs between red and black oak, and at the time I wondered whether this difference was significant."

during September. This study is carried on in coöperation with the U. S. Department of Agriculture, Division of Forest Pathology, who are trying out various strains of Japanese chestnut in all the states east of the Mississippi. The results of the experiment are not very satisfactory. The introduced chestnut, while resistant to the blight which has wiped out the American chestnut, is very susceptible to a native twig blight which does comparatively little damage to domestic trees. This twig blight, belonging to the genus Phoma, girdles the introduced seedlings while they are still small. According to the U. S. foresters who made the examination, the two most successful plantations in the country, are those on the East Orange Water Works near Chatham, and on the Newark Water Works near Newfoundland. In both of these cases the chestnut appears to have come through the danger period and reached diameters large enough to prevent girdling by the twig blight.

From *New Jersey Forestry News*,
July-Sept., 1932.

A Merchantable Height Table for Beech in the Northeastern States

In order to facilitate timber estimating and to increase the accuracy of the estimate, the accompanying Table 1 for beech (*Fagus grandifolia*) has been prepared.

The table is based upon data collected by the timber survey crew working on the White Mountain National Forest in New Hampshire during the past two years. It has been carefully checked by statistical analysis; the total plus or minus error for the table is 2.35 per cent, based on 350 carefully measured trees which were mathematically selected in order to eliminate personal choice in the selection.

Table 1

MERCHANTABLE HEIGHT AND VOLUME TABLE FOR BEECH

D. B. H. Inches	Height Feet	Volume Cu. ft.	Defect Per cent
10	23.7	11.0	7.6
12	26.3	15.0	8.5
14	28.7	21.0	9.6
16	31.0	30.0	10.8
18	33.0	31.0	12.0
20	34.9	52.5	13.3
22	36.5	66.0	14.8
24	37.4	79.0	17.4
26	37.5	92.0	22.8
28	37.2	107.0	34.8

It will be noticed that the height begins to decrease above the 26 inch d.b.h. This is due to the fact that the beech of large diameter, in the Northeastern States, is very defective, — resulting in broken or badly damaged tops, which reduces the merchantable heights. Also, most of the beech in the large diameter class is found chiefly in cut-over or culled stands,—also resulting in short merchantable length.

The above facts are substantiated by the large percentage of cull shown for the larger diameter in the table.

It is quite evident that the foregoing table will speed up all phases of timber estimating, tend to eliminate errors, and become quite flexible in its use. It is applicable to all Sites 1 and 2 in the White Mountain area and the Northeastern States irrespective of types. However, the underlying basic principles are constant factors and with modifications the table may be readily adapted to different sections.

Harold C. Hebb,
White Mtn. National Forest.

Sustained Yield of Adirondack Spruce and Fir

A study of spruce and balsam fir growth on Lot 56, Tp.20 (Newcomb, N. Y.) shows the possibility of continuous production of pulpwood without impairment of the wood capital. Four systems of di-

ameter limits were used:

1. Cutting spruce to 8 inches d.b.h.; fir to 6 inches d.b.h.

2. Cutting spruce to 12 inches d.b.h.; fir to 10 inches d.b.h.

3. Cutting spruce to 10 inches d.b.h.; fir to 8 inches d.b.h.

4. Cutting spruce to 10 inches d.b.h.; fir to 6 inches d.b.h.

On the basis of present (1931) cut and the possible cut in 1956, this works out as shown in Table 1 for the average acre of each type.

From this analysis it is evident that, in order to "eat your cake and have it too," the best results are achieved by cutting the spruce to 10 inches diameter breast high and the fir to 6 inches diameter breast high, not rigidly adhering to these limits, but using them flexibly, and cutting smaller trees as conditions dictate.

By raising the diameter of spruce (no change in fir) from 8 to 10 inches, the present cut is 0.9 cords per acre less on the softwood flat type and 0.53 cords per acre less on the hardwood type, but the *next* cut (25 years hence) is 1.37 cords more on the softwood flat type and 0.8 cords more on the hardwood type—and the increase is all in spruce, since no change is made in the cutting of the fir. By leaving the 9- and 10-inch spruces now the owner can cut them 25 years hence when they will be of an optimum size for pulpwood and will yield from one-third to one-half cord more per acre than if cut now. Furthermore, the cut 25 years hence is practically the same in quantity as the present cut. In other words, the wood capital is unimpaired, the quality is improved and the forest is kept continuously productive.

TABLE I

PRESENT AND PREDICTED CUT OF SPRUCE AND FIR PEELED PULPWOOD

System Number	Cords per acre, to 3 inch top diameter and 12 inch average stump height			
	Softwood Flat		Hardwood Type	
	1931	1956	1931	1956
1	6.71	4.62	3.77	2.20
2	2.56	8.93	1.56	5.94
3	3.93	7.81	2.83	4.48
4	5.81	5.99	3.24	3.00

NOTE: System 1 has been used by a leading operator in New York State; 2 is recommended by the Northeastern Forest Experiment Station; 3 is a modification of 2, but is still too conservative for most operators; 4 might be described as the "happy medium."

A. B. RECKNAGEL,
Cornell University.

SYCAMORES INCUR NEW ORLEANS OFFICIALS' DISPLEASURE

The majestic sycamore tree, famed in Southern prose and poetry, faces destruction within the limits of the City of New Orleans following action December 9th by the city parking commission.

At a meeting held by this body it was declared that the clutter caused by falling sycamore leaves on thoroughfares increased the danger of floods in city streets following severe rains due to the clogging of drains. The leaves choked catch basins it was explained and prevented rapid drainage.

One member pointed out that if there had been a heavy rainfall during the past two months that there would have been several sections of the city flooded for a lengthy period. He said that the autumn season found the streets, particularly in certain sections of the Vieux Carre, the old quarter of New Orleans, covered with the sycamore leaves.

The commission passed a resolution to stop all future planting of the unpopular sycamores and to do everything in their power to remedy the situation.

The day previous to the parking commission meeting the Sewerage and Water

board passed a resolution urging that planting of sycamores be stopped and that all such trees at present shading the city streets be cut down because of the flood menace they constituted.

Commissioner of Public Property Joseph Skelly has issued a statement that his department will make an intensive effort to keep the city's drains clear of the obnoxious leaves.

The water board's effort to have the trees destroyed did not meet with approval of the parking commission, however, who stated that the prevention of further planting will eventually make the tree extinct in the city limits. Means will be taken to prohibit private home owners from planting sycamores.

For hundreds of years the sycamores of New Orleans have rivalled in prominence the widely known magnolias and palms of the semi-tropical capital of the South. Within the passage of a half century, unless the present plan is changed the sycamore will virtually be gone from New Orleans.

Cost of Thinning Long-Leaf Pine

The thinning of long-leaf pine stands has been a subject of much debate among foresters. Attention is being given to this matter all over the South and large sums of money are being spent annually for this work. It is likely that each year an increased amount will be done since the cost is low. Once the results of thinning are seen and the low cost realized, the progressive forest owner is likely to thin his long-leaf pine. Many neighboring land owners have done this on a large scale under the direction of Austin Cary, Logging Engineer, U. S. Forest Service.

It is the purpose of this paper to show, from the experience gained personally in thinning 725 acres, how the cost of thinning a large area to any desired rate of stocking may be calculated. Dr. Cary supervised the work at the start and occasionally checked back on the crews. The area covered was typical long-leaf pine in Baldwin County. These stands have blank areas, small bay heads, older patches of saw timber and some scrub oak hills interspersed with the thickly stocked stands of 100 per cent long-leaf pine. The stands thinned were uniform and in age from 23 to 28 years, allowing 8 years for the seedlings to reach breast height. The dominant trees have an average diameter of from 5 to 7 inches at breast height, and are from 35 to 45 feet in height. Until five years ago fires ran through annually unchecked.

The thinning crews were made up of men hired to look after fires. Damp days were chosen when only slight danger of fires existed. The rate of pay varied from $1.50 to $3.00 per day, with the greater part at $2.25 per day. The tools used were regular brush axes and special thinning axes costing $18.00 per dozen. For efficient work, tools with long thin cutting blades are essential. While the labor in this case was above the average, yet common labor can accomplish relatively the same amount when properly supervised. A four-man crew was used with one man to mark trees to be cut while three men cut them. It was found best for one man to mark the trees even with a smaller crew, as those cutting would not have to stop and decide with each other on each tree to be cut. An accurate cost account was kept of the operation and is as follows:

Tools—Axes, files and grindstone	$10.00
Labor	102.35
Transportation, board, etc.	38.15
	$150.50

The space thinned to in this case was approximately 15 feet by 15 feet, or an average of 200 trees per acre. There was one thick patch of younger trees of small

area thinned to approximately 10 feet by 10 feet, as it was thought best to not open up this stand to the regular density. A rule adopted was to leave all trees that would reach a diameter of 7 inches within a short period. An exception was made in the case of trees turpentined previous to the purchase of the land, and trees of poor form. The main portion of the saplings cut had a diameter range of from 1 to 4.5 inches with an occasional turpentine tree or tree of poor form as large as 8 inches. All suppressed trees were cut.

The trees were cut at around three feet from the ground and were allowed to fall in all directions and to lie and rot where they fell. It is expected that after three years the slash will be fully rotted, and no fire hazard remain.

A 4 per cent estimate reveals that some 110,000 trees were cut on the 725 acres. In the estimating, blank areas amounting to 285 acres were mapped, leaving 440 acres as a thinned area. An average of 250 trees per acre were removed from the thinned area. The total cost divided by the number of thinned acres is 34 cents per acre, as the average cost for the actual thinned area. The gross cost of going over the entire area amounted to an average of 21 cents per acre. One man thinned from 6 to 8 acres per day of the thicker stands, or cut some 1,600 to 1,800 trees.

W. R. Becton,
Forester for Ben May,
Mobile, Ala.

A Fast-Growing Douglas Fir

Recently two 3-inch wafers were cut from a stump on the McDonald Forest (Oregon State College), which indicates the possibilities of open grown trees to put on wood fibre. At stump height, about 3 feet, this tree was 65 years old and 28 inches in diameter. The rings could be interpreted to read that, starting as an open grown tree, it gradually came into competition with its neighbors. After the 15th ring from the pith, there was a very gradual and regular reduction in the width of the rings.

In examining the cross section, some of the rings were seven-eighth-inch in width and from one-half to two-thirds summer wood. This tree was 16 inches in diameter when 17 years old and 18.75 inches in diameter when 20 years of age. The Institute of Forest Genetics has set as its goal a tree that, on the better sites, will attain a 16-inch diameter in 25 years. It can be seen that this goal is therefore not beyond the attainable, as this particular tree was growing on a rather dry divide where the rainfall does not exceed 43 inches, and where summer dry periods of 120 to 140 days are not uncommon. Many portions of the Douglas fir region should be able to surpass this growth record because of better growing conditions.

T. J. Starker,
Oregon State College.

A Method for Computing the Proper Density for Maximum Increment

Uno Wallmo, a retired Swedish district forester is well known to many American foresters for his critical writings on silviculture and especially for his enthusiasm for selection. In a recent paper in *Skogen*, Vol. 19, Nos. 16, 17, 18, 1932, he gives a formula for determining the correct density for larger trees standing in groups under the selection system, but equally applicable to all stands under any system whatsoever.

The first step is a determination of the site quality. Existing tables based on increment in cubic meters per hectare are not entirely applicable to selection stands and Tor Jonson's 1914 curves of height on age were recalculated to fit local con-

itions. The site classes obtained, designated by arabic numerals, correspond to the culmination of the mean annual growth in cubic meters per hectare.

To know whether a given tree has passed this point, and consequently should be felled, the tree is assumed as a productive unit on an area of one hectare or 10,000 square meters. Then if the tree's current annual increment in cubic meters be T, the site quality B, and the area actually occupied by the tree crown, S, the formula becomes $\frac{S}{10{,}000} = \frac{T}{B}$ where the increment is at the culmination, or $S = \frac{T \times 10{,}000}{B}$. Where S is found by measurement of the crown projection to be less than $\frac{T \times 10{,}000}{B}$ a cutting, giving additional side light is indicated; if more than $\frac{T \times 10{,}000}{B}$ the tree should be harvested and its place taken by reproduction. While the example refers to an individual tree, the practical application would usually be to groups of trees or stands, or $\frac{\Sigma T \times 10{,}000}{\Sigma S} = B$. To simplify field work when marking, tables have been constructed for the critical crown projection areas, i. e. that corresponding to the intersection of current and mean annual increment, for each site and width of 10 annual rings. An approximate formula for average sites is "The normal crown projection area on average good sites equals the square of the radius at breast height in cm times 0.12." Actually the constant 0.12 rises for poor sites and sinks for better ones. An abstract of Wallmo's paper is to appear in *Biological Abstracts*.

HENRY I. BALDWIN,
Penn. State Forest School.

WASHINGTON STATE FORESTRY CONFERENCE

Taxation and land use were the two problems before the Washington State Forestry Conference at the 11th annual meeting held December 2nd in Seattle. The meeting was presided over by Dean Hugo Winkenwerder of the University of Washington College of Forestry.

State Forester Joy presented the status of land listings under the Yield Tax Law of 1931. 181,000 acres of land have been listed to date under this law which calls for their assessment at $1.00 per acre. 200,000 acres are on file for examination and possible listing. By January 1, 1933 it is expected that another 200,000 acres will have been filed with the State Forester's office for examination. Not all of this will be listed under the law. Strong opposition arises in some quarters. Lack of legislative appropriation handicaps the operation of the law, yet satisfactory progress has been made in the examinations.

TAX ON OLD GROWTH HELD EXCESSIVE

The address of C. A. Lyford, of the James D. Lacey Company, on taxation of old growth timber in the State of Washington, stressed the need of checking the dangerously excessive rate of depletion as a means of reducing the gap of time between exhaustion of old growth and maturity of new growth. He pointed out that the major portions of the industrial, commercial, and residential equipment within the state and the taxes derived therefrom are dependent upon a continued supply of standing timber as raw material. Mr. Lyford rated the tax burden, currently payable in cash and continually crowded upward by means of increases in assessed valuation, as an important secondary factor in forcing unwise exploitation; a proposed deferred payment, without interest, of a progressively increasing proportion of the annual tax until the timber is

cut, without alteration of the existing procedure of assessment and levy.

Discussion of the tax situation emphasized an intense feeling that relief legislation is imperative if the timber tax problem in Washington is to be solved definitely. This is most apparent in those counties where standing timber is the source for a large proportion of the tax receipts. One suggestion made of practical application was that effective control of the absolute rather than the relative tax burden lies in a careful and pointed scrutiny of public expenditures.

LAND USE PROBLEMS

The land situation in Washington may not be as acute as it is in some other states yet the data on existing conditions as presented by Major Joseph Jacobs pointed out some sore spots in the economic conditions of the state due to decreases in population, depleted natural resources, vast undeveloped possibilities, and the deplorable ignorance on the part of the public and governmental agencies as to the gravity of the situation.

Relations of forests to land-use was presented by Prof. D. S. Jeffers of the University of Washington College of Forestry. The discussion, which took on a very practical phase, was led by H. J. Andrews of the Pacific Northwest Forest Experiment Station and closed by Prof. Rex Willard of Washington State College. The duty of governmental agencies towards the citizen and the use of marginal and submarginal lands, the responsibility of citizens in reducing the many overlapping tax levying bodies, and the need for a state-wide survey were emphasized. The time is not far distant when the State of Washington will be faced with the necessity of investigating the future of its industrial stability and this conference went on record as favoring an intensive survey of actual conditions.

D. S. JEFFERS,
University of Washington.

FOREST PURCHASE PROGRAM SLOWED DOWN IN 1932

The United States has purchased a total of 4,727,680 acres of land for national forest purposes in the last 21 years, and has about half completed its program of land acquisition within the 41 national forest purchase units established to date for timber growing and watershed protection in the eastern half of the country, according to the annual report of the National Forest Reservation Commission recently submitted to Congress. Because of limited funds the purchase program was materially slowed down for the fiscal year 1932, and purchases approved by the Commission during the year aggregated only 83,086 acres as compared to 547,945 acres in 1931.

CONGRESSMAN LEAVITT'S CONTRIBUTIONS TO FORESTRY

Scott Leavitt, Representative from the 2nd District of Montana, had come to be looked upon as one of the outstanding forestry leaders in Congress, and was without doubt the foremost authority on forest conservation in the House of Representatives. Born in Michigan, Scott Leavitt served before Santiago, Cuba, in the Spanish-American War, was later a student at the University of Michigan, and entered the United States Forest Service as a Ranger. In 1910 he was Supervisor of the Lewis and Clark National Forest, and in 1913 Supervisor of the Jefferson National Forest. Later he became Federal Director for Montana for both Public Service Reserve and War Emergency Employment Service during the World War. In 1922 he was elected to the 68th Congress, and was re-elected to the 69th, 70th, 71st and 72nd Congresses. During his first term Mr. Leavitt took an active part in the Clark-McNary Bill, and the in

hate knowledge of forestry needs he dis-layed at that time was an important fac-or, both in establishing his standing in orestry matters and in securing the pas-age of that bill.

A memorial to Theodore Roosevelt, Conservationist, which stands on the Con-inental Divide, was erected under the au-hority of Congressman Leavitt's legisla-ion.

The University of Montana uses a for-st tract at Fort Missoula as a forest labo-atory under agreement with the War Department, and this, too, was arranged by Congressman Leavitt, who now has a bill pending to transfer this tract to the State School of Forestry for perpetual use there. In the 70th Congress, Congressman Leavitt secured an amendment to the Flood Control Bill reading: "Provided further that the President shall proceed to ascertain through the Secretary of Agricul-ture and such other agencies as he may deem proper, the extent to and the man-ner in which the floods in the Mississippi Valley may be controlled by proper for-estry practice."

It was through this amendment that the relation of forestry to flood control in the Mississippi Valley obtained its first offi-cial recognition.

The cause of forestry loses an able friend in the failure of Montana to return Congressman Leavitt to the next Congress. Throughout his entire career he has be-friended sound forestry legislation with the characteristic vigor that has made him a force for progressive legislation. His past experience with the Forest Service, his continuing interest in conservation which has kept him abreast of scientific development as well as legislative prog-ress, combine to place Scott Leavitt in a uniquely helpful position in furthering forestry.

TOM GILL,
Charles Lathrop Pack Forestry Trust,
Washington, D. C.

FOREST MANAGEMENT CONFERENCE

Lumbermen, foresters and public land officials from all western states and British Columbia assemble in Seattle, March 22-24, under the auspices of the Western Forestry and Conservation Association, to discuss problems of forest land management. The conference is semi-official in that representatives of state and federal government meet with those of private forest protective organizations to determine methods and policies of coöperation.

Topics include coöperative protection problems and difficulties under the present economic situation including use of unemployment relief funds, also problems of land ownership that threaten heavy return of private land to public ownership. It is supposed that this will be the most exciting meeting of the Association.

E. T. ALLEN.

FOREST NURSERYMEN MEET

A state forest nurserymen's conference was held at Syracuse, N. Y., on November 29 and 30, sponsored by the New York State Conservation Department and the State College of Forestry.

The purpose was to stimulate technical practices through exchange of ideas by nurserymen, presentation of latest developments in nursery work and free discussion of the technical papers that were presented.

State nurserymen from Massachusetts, Connecticut, Pennsylvania and Michigan were represented and participated in the program. The district foresters of the New York conservation department as well as those connected with the nursery work were present and enthusiastically entered into the proceedings. Attendance approximated 100 persons.

The U. S. Forest Service furnished two

representatives, L. S. Gross and H. Basil Wales, whose papers, "Planting Problems in Region 7" and "Mechanical Aids in Nursery Work," provoked much discussion.

Other speakers included Dr. Buckman of Cornell on the maintenance of soil fertility, Dean Ladd of Cornell on the land problems of the state, H. I. Baldwin of Pennsylvania State College on seed certification, and speakers from the N. Y. State College of Forestry and the New York conservation department on various phases of nursery work and planting.

The last afternoon was profitably spent at the Salina Street forest nursery station viewing experiments in the nursery beds and various plantations.

The meeting was a decided success and became practically a nursery school. A desire was expressed to have such a conference annually.

Biological Abstracts Index Ready

Aided by a grant of $20,000 from the Rockefeller Foundation, the publication of the index to Volume 2 of *Biological Abstracts* has been made possible and it is now on sale. The Rockefeller grant also assures early completion of the remaining volumes. The editors of *Biological Abstracts* (address at University of Pennsylvania) are offering back files of volumes 1 to 4 at greatly reduced prices. Volume 7 for 1933 is in course of preparation.

Graduate Fellowships Available

The Morris Foundation that has recently affiliated the Morris Arboretum at Chestnut Hill, Philadelphia, with the University of Pennsylvania, has also provided funds for a number of graduate fellowships for students in botany working for higher degrees. A stipend of $1,250 accompanies each appointment. Since appointments may take effect with the middle of February, applications for consideration should be sent at an early date to the Director of the Morris Arboretum, at the Department of Botany, University of Pennsylvania.

The Lumber Industry in 1933

As construction goes, so goes the lumber industry, particularly the softwood branch of it. Hardwoods are also materially dependent upon building, and they are vitally affected by industrial activity.

A recent survey has indicated that an increase of 20 per cent in residential building in 1933 over 1932 is not an unreasonable expectation. Potential demand for residential space has been accumulating for a number of years, for it must be remembered that residential building reached its peak not in 1929 but in 1925. In the current year home building has been less than 40 per cent of 1931. The inducement of low building costs is also to be taken into consideration. Residential buildings may now be erected at costs about equivalent to those of the later pre-war period.

There are indications that the ordinary channels of building credit are opening up again, and there are the new channels created by the Reconstruction Finance Corporation and the Home Loan Bank system. The practical effects of the latter will appear in 1933.

The modernization market

In addition to new building, the renovation and modernization movement, which has been growing for several years, has attained great momentum and it is possible that 1933 will be the period of great

st outlay for such work that the country as ever known. Modernization has been he largest single source of lumber demand in the last 6 months. Repairs and rebuilding are in particular harmony with times of enforced economy, and the first tendency of increased purchasing power for housing is in that direction more than for new structures.

New building and improvements of old buildings call directly for increased consumption of hardwood items and indirectly for furniture.

In the industrial field the furniture industry showed a notable improvement during the autumn months. Automobile manufacture ranks after furniture as a consumer of hardwood lumber. The small volume of production in recent months is expected to be followed by increased output in the near future.

FINANCIAL FACTORS

The financial help the Reconstruction Finance Corporation has given to the railroads already has resulted in an increased demand for lumber for freight cars and maintenance-of-way material. Normally more softwood lumber is used in freight car construction than for any other purpose except building, boxes and crating. There have been recent substantial orders for cross ties as a result of Reconstruction Finance Corporation assistance. The Corporation's loans for various self-liquidating projects are stimulating the demand for lumber.

The lumber box and crate industry usually takes from 12 to 15 per cent of the total lumber cut, and is closely linked to the general trade movement. The volume of consumption of fruits and vegetables largely influence the demand for wood boxes and crates. A recent survey showed that there is no present need for increased production of box lumber but that stocks are not large.

The degree of progress of the lumber industry in 1933 will be largely determined by rural demand. Farmers and farm communities use, perhaps, 40 per cent of the entire softwood output—which in turn is over 80 per cent of the national lumber production. The farmers are ordinarily the most extensive wood-using group among the American people. About 90 per cent of farm buildings are of lumber construction. The normal annual requirement of the average farm is over 1,500 feet of lumber. Rural prosperity would mean, therefore, an annual market for over 9,000,000,000 feet of lumber—a volume equal to three-fourths of the total national lumber use in 1932.

WILSON COMPTON,
National Lumber Mnfrs. Assoc.

LUMBER INDUSTRY ACTIVITIES REGROUPED

That the organized lumber industry intends to make a concerted drive to strengthen itself better to weather the current business depression and to fortify itself for aggressive promotive effort as conditions improve, is evidenced by its recent formation of "American Forest Products Industries, Inc.," to take over the trade promotion activities of the present National Lumber Manufacturers Association, and by its plan to launch soon a third organization to be known as "Wood Research Trust, Inc."

The newly constituted American Forest Products Industries, Inc., came into active operation on January 1st. According to a bulletin from the National Lumber Manufacturers Association, it takes over the activities of the lumber manufacturers association relating to merchandising, trade promotion, improvement and refinement of product, standardization, trade-marking, certification, building engineering and research. The National Lum-

ber Manufacturers Association continues the functions of a national industry association representing timber owners and lumber manufacturers and serving as the spokesman in national industry matters for the affiliated regional associations.

The new project is essentially a combined activity of the forest products industries and timber owners, and prospectively, of lumber exporters and distributors. It is in part the response of the forest products industries to the recommendation in 1931 of the U. S. Timber Conservation Board.

Its broad purpose, as announced, is to bring order and coördination into a great group of related industries comprising two score industrial and commercial groups and over 50,000 industry units, and the sources of livelihood for nearly five million people. Its plans go to the heart of the problem now confronting industry generally but which has particularly tormented the forest industries for more than a decade, namely, the unbalanced relation between production and consumption resulting from a number of causes but largely from past over-emphasis on production capacity and logging and manufacturing technique, and under-emphasis on distribution, marketing and consumption. In a still broader sense, it aims to conserve and perpetuate, through sound economic practices, a great natural resource which is inherently self-reproducing and to encourage sustained-yield operations among the timber industries.

Membership in the American Forest Products Industries, Inc., will be composed of timber owners, manufacturing companies, and distribution agencies which conform to certain high standards of manufacture, marketing and trade practice.

The officers of the new organization as announced are: Chairman, Board of Trustees, John W. Blodgett, Grand Rapids, Mich.; Chairman, Board of Directors, G. W. Dulany, Jr., Chicago; Chairman, Executive Committee, C. L. Hamilton, St. Paul, Minn.; President, Wilson Compton, Washington, D. C.; Vice President, Carl W. Bahr; Treasurer, W. M. Ritter, Columbus, Ohio; Secretary, H. G. Uhl, Washington; Manager, W. F. Shaw.

The purpose of the proposed Wood Research Trust, Inc., was announced as being for the conduct of fundamental research as a means for the permanent maintenance and continuance in use of lumber and timber.

REVIEWS

Handbuch der Freien Durchforstung (Handbook of Tree Thinning). By C. R. Heck. *E. Schweizebartsche Verlagsbuchhandlung. Stuttgart 348 pp. 1931.*

In this rather voluminous work the author discusses the value of his "Free thinning." It is in a measure the compilation of his previous publications on this subject of which the first appeared in 1897. There has been included additional data to substantiate his conclusions.

One readily gathers the impression that Heck is opposed to the methods of thinning as developed by the German Forest Research Institute. Although in the final analysis his system seems to fall in the "Hochdurchforstung" (crown thinning) class, the main difference according to Heck being in the initial viewpoint. In Heck's Free thinning the attention of the forester is directed towards the individuals that are to make up the final stand while in the other systems it is directed towards the portion of the stand that is to be removed.

The author begins with an introduction in which he develops the various concepts of what constitutes a beautiful forest or a beautiful tree from the scenic standpoint and from the viewpoint of a forester. It is his aim to develop this beautiful forest by taking advantage of the inherent qualities of species and individuals through the effect of his "Freie Durchforstung."

As a basis for the discussion of his thinning system he first discusses the silvicultural care of the forest and forest soil, particularly early cleanings in young stands and the development of thinning practice up to and including his free thinning.

Free thinning is summed up in the words of the author as "Freie bahn den Tüchtigsten" (open way for the ablest). It requires the early selection usually of the dominant thrifty trees that will make up the final stand. All thinnings are planned to provide suitable growing space for these individuals. The interval between thinnings is placed at from 3 to 6 years since from a practical and financial standpoint as well as for the best development of the stand this period is short enough.

As an aid in analyzing the stand and determining which trees to leave Heck uses Kraft's crown classification of 1884 enlarged by a system of stem classification of his own. Kraft's system comprises five main classes and two sub-classes as follows:

1. Predominant trees.
2. Dominant trees.
3. Co-dominant trees.
4. Intermediate trees:
   a. Fairly well developed crowns.
   b. Poorly developed crowns.
5. Suppressed trees.
   a. With good crowns (appearing only in tolerant species).
   b. Dead and dying.

Heck's stem classes are seven in number as follows:

a. Straight clean trees, clear length 10 m or more.
b. Fairly good trees, clear length less than 10 m.
γ Crooked, limby trees.
δ Forked trees.

Σ Heavily limbed trees.
ξ Root sucker.
π Diseased trees.

The combination of these two systems makes possible 49 classes. At first glance this seems rather cumbersome. In actual practice, however, the entire range of stem classes does not appear in each crown class. Consequently the number of classes used is not burdensome. Heck claims that the further differentiation into stem classes is of distinct value in the selection of trees where the quality of the product is an important consideration as in this system.

While the emphasis is placed upon value of the products, the author claims that this is attained with no loss of time or volume. Early pruning, both natural and artificial, is an essential part of the system. The author advocates early pruning of the final crop trees and claims that the increased value of the product will more than carry the cost of the operation.

Much is left to the judgment of the forester carrying out the thinning. No definite rules are laid down. If it is necessary to leave a tree of a lower crown class with a good form to fill an opening it is entirely permissible. Heck makes a strong point of developing initiative and responsibility in the subordinate personnel. He believes in making his principles understood and allowing the subordinate considerable latitude in executing them. This is based in part on his contention that the forest is a living thing capable of infinite variation and that no set of hard and fast rules would be applicable in all cases.

His conclusions as to the value of free thinning are based on the results of observations extending over periods of from 6 to over 50 years on ten permanent thinning plots and six temporary plots. There are four plots in beech stands, one in an ash stand, two in spruce stands, one in a fir stand, one in oak and one in a stand of larch, pine and spruce. The analysis of the plot data is very complete. Its value would have been greatly increased if a comparison had been made with unthinned check plots and plots thinned under the accepted system.

Following the discussion of the individual plots the author discusses his deductions from a scientific and technical viewpoint. The natural form of the forest, its growth, its silvicultural treatment and the relationship of free thinning to the various systems and the correlation between weather and growth are all fully discussed.

The practical application of free thinning is discussed for each species. Probably one of the most valuable features is a summary of the important points brought out in the book. There are 160 of these statements varying from one sentence to a paragraph or two. For those who wish a more detailed discussion of any of these points he includes specific references to the text itself.

Whether or not one agrees with all the conclusions the book is of value. It is one that could well be studied by American foresters engaged in thinning work. The style is at times a bit involved and as the author states in the introduction entirely German.

T. Schantz Hansen,
Yale Forest School.

The Wind River Arboretum from 1921 to 1932. By Thornton T. Munger and Ernest L. Kolbe. *Mimeographed Pamphlet, U. S. Forest Service, Portland, Oregon. 1932.*

This report, as is evident from the title, is one of progress of the Wind River Arboretum over the past twenty years. In

1912, 10 trees of each of 16 species, were planted in the nursery. That stock has now reached some 1400 specimens of conifers, representing 108 species. Also 284 specimens of broadleaf trees representing 39 species are at present growing in the arboretum. In adjoining nursery beds are 32 additional species of conifers, making a total of 179 species under test.

The purpose of the arboretum as expressed in the report are:

"1. To test the behavior of the arborescent species of the world in this locality under natural conditions where soil and climate is typical of much of the lower altitudes of the western slopes of the Cascade Range in Oregon and Washington, in the hope that the suitability or unsuitability of exotic species for forest purposes may be demonstrated;

"2. To create a museum of living trees where the student of dendrology could observe them and make collections;

"3. To have at this important center of forest activity an exhibit of many kinds of trees which would be of interest and educational value to the general public and visiting foresters."

Geographic, topographic, soil and climatic conditions at Wind River are given so that comparisons may be made with other regions.

The suitability of species for that region is tabulated. In this connection, it is of interest to note that broadleaf species do not do well at Wind River.

A feature of the bulletin is the lithoprinting of all maps and photographs.

THAD J. PARR.

Wood-Liquid Relations. By L. F. Hawley *U. S. Dept. of Agri. Tech. Bul. 248. Pp. 35, Fig. 14. Gov. Print. Office, Washington, D. C. June, 1931.*

Many of the problems in the drying and preparation of green wood for use, and in the shrinkage and other factors which affect its adaptability while in use have their origins in the fundamental relations between wood and liquids. This publication summarizes present knowledge of the relation between wood structure and liquids and, in the words of the author, "serves as an introduction for a series of publications that will report experimental research on various parts of the general problem of establishing these relations."

A generalized description of the structure of hardwoods and softwoods paves the way for an understanding of the wood-liquid relations which follow. A knowledge of the static relationships of the wood-liquid systems are prerequisite to an understanding of the dynamic changes, since the latter "are due directly to a lack of equilibrium in the static relationships." The absorption of water by wood substance is discussed in the light of the most recent knowledge, especially with respect to heat of absorption, swelling of wood, and the effect of moisture content on strength and on thermal conductivity. The portion dealing with fiber-saturation point, i.e., the moisture content at which further reduction causes an increase in the strength of the wood, and methods of determining it is a brief review of material already known and published.

An analysis of the conditions obtaining during impregnation leads to the conclusion that this process may well be considered as the movement of free liquid. The laws governing such movement through small tubes is simply expressed by Poiseuille's equation. Certain variables might be considered as influencing the flow of liquids, and these are analyzed. Practically all of the resistance to flow is localized in the orifices, hence the resistance to flow in the cell cavities may be considered as negligible. The sudden change in diameter of the passages brings into play the variable known as impact

turbulence. Even under the most exceptional conditions this would necessitate a correction not exceeding 1.6 per cent.

Capillary forces in the cell cavities amount to about half an atmosphere of pressure, a figure that is negligible in view of the greater pressures used during impregnation. The capillary pressures caused by meniscuses in the orifices of the pit membranes may exceed 50 atmospheres. Where the impregnating liquid wets the wood they may be neglected as aids to impregnation because of the short distances through which such pressures are active. But when the liquid does not wet the wood, these small short capillaries of the pit membranes are exceedingly important, since they determine the minimum force required to cause the initial flow of liquid into the cavity.

During impregnation air may be trapped in two different ways. In the first case the air occupies the central untreated portion of the piece and has a negligible effect on the penetration of liquids. In the second case the air is trapped as bubbles within the cell cavities. These markedly affect the flow of the impregnating liquid.

Previous work indicates that penetration varies more directly with pressure than with the square root of the pressure as might be expected. It is suggested that this may be attributed to the plasticity of wood which leads to a stretching of the pit membranes with a consequent increase in the size of the orifices.

A summary of experimental data from several sources confirm, within the limits of their inconsistencies, the idea that there is a straightline relationship between the penetration and the square root of the reciprocal of the viscosity. This is still further confirmation that the effect of viscosity on penetration is what would be expected from the laws governing the flow of liquids in capillaries.

Two general types of moisture gradients have been observed in wood during the drying process. One of these approaches the gradient expected if there were no movement of free water, while the other conforms to that expected with a movement of free water. By means of well-designed diagrams the author discusses the evaporation from wood in the light of wood structure and the evaporation from the free surface of water in a capillary. This leads to a theoretical explanation of the two types of moisture gradients, suggesting that the difference may lie in the size of the openings in the orifices between the cell cavities.

J. Elton Lodewick,
Pacific Northwest Forest Experiment Station.

Transportation of Wood in Chutes. By Alexander M. Koroleff and Ralph Clement Bryant. *Yale University School of Forestry, Bulletin No. 34. Pp. 139, Fig. 76. Bibliography. Yale University, New Haven, Conn. 1932. $1.00.*

To those foresters and loggers who are not employed in regions where chutes are common forms of transportation for wood or logs, a publication of the kind here reviewed might perhaps seem only of historical value. Such criticism would be grossly unjust and unwise. A prominent Pacific Coast logging executive once remarked that, in planning the operation of a timber tract, one should never overlook the consideration of any type of logging that had ever been used. This seems a very sound viewpoint because parts of any stand of timber may present conditions totally unsuited to the prevailing logging methods of the region and ideally suited to methods generally used in a region very remote. The authors of this

bulletin are therefore to be commended for preparing a publication on a type of logging which may have experienced increasingly restricted use during the past decade. In many regions, as the logging proceeds toward the lighter, less easily accessible stands, the very conditions might present themselves, under which some type of chute transportation described in this bulletin, may operate at its highest ratio of advantage.

The bulletin is admirably written in easily understood language. The material is systematically presented, through a logical, step by step development and through good use of headings and subheadings and many excellent cuts. The authors are especially to be commended for confining the presentation of the technical material to a separate section. Frequently, the practical type of man is scared away from a perfectly good bulletin through the treatment of rather technical details along with the applied aspects of the subject under consideration.

Part 1 of the bulletin, written by Koroleff, is based upon both the wide experience and the wide reading of the author. It contains an exhaustive description of the construction and operation of the various types of wood and log chutes—gravity and trailing—that have been used in various parts of the world. Considerable attention is given to the methods used to check and accelerate the velocity of the chuted material. The damage to chuted logs receives some consideration, mainly through a brief resumé of I. V. Anderson's studies in Idaho.

Part 2, by Professor Bryant, treats of the technical side of chute construction and operation. Details are given of the engineering principles involved in proper alignment of the chute, both horizontally and vertically, in order that it may function properly under a given set of conditions. Methods of expediting the field work of engineering are also given. The latter portion of Part 2 is devoted to the engineering principles of checking the velocity of wood and logs in chutes. The laboratory and field experiments of Miura, especially, are discussed in some detail.

Part 3 contains a bibliography of 43 numbers, many of them from foreign sources.

It should be noted that before the material in the bulletin can become of full effectiveness to foresters and loggers, anywhere and everywhere, much more data must be presented on the factors governing the cost of handling wood and logs by this method. Such a statement as "the cost of chuting a cord of small-sized wood - - - - varies from 15 cents to $1.00 per cord" is not very helpful to the operator who is contemplating the use of a chute in a region where chutes have, hitherto, not been used or only infrequently used. What he wants to know is just what are the factors of topography, surface conditions, density of stand, size of timber, etc., that cause the cost to be 15 cents per cord in one case and perhaps $1.00 in another. Most of the cost data presented in the bulletin, while perhaps of direct help in the region for which they are quoted, are essentially only aids to the descriptive material in presenting a somewhat clearer picture to the reader of the surrounding conditions. This should not be construed as a criticism of the authors, in the writing of this bulletin. They have set out to write a bulletin describing the methods of constructing various types of chutes and the engineering principles involved in such construction. In this they have succeeded admirably. However, it was thought well to point out in this review, the sort of additional information that is needed to make the bulletin of highest use to any type of woods

operator and, in so doing, to suggest to investigators in this field, a possible project or projects for further study.

MYRON KRUEGER,
University of California.

Effect of Extractives on the Strength of Wood. By R. F. Luxford. *Journal of Agricultural Research, Vol. 42, No. 12, pp. 801-826. Gov. Print. Office, Wash. D. C. June 15, 1931.*

Investigation of the characteristics of wood indicate a more or less definite relation between specific gravity and various strength properties. But it has been observed that some species do not agree as closely with the average relations as might be expected. It has been further noted that among the species exceptional in these relations are many containing relatively large amounts of extractives that add materially to the weight. The study reported in this paper was designed to show whether or not the extractives may contribute to the divergence of the strength properties from the normal.

Three species (redwood, western red cedar, and black locust) were selected for investigation because of their relatively high extractive content. The test values for the various strength properties were adjusted in accordance with the specific gravity-strength equations already developed by the Forest Products Laboratory. The additional weight of extractives in a piece of wood was considered as an additional weight of wood substance. The extractives were deemed to have increased the strength only if the increase were greater than that which an equal weight of wood substance would have given.

The comparison of sapwood, which is usually low in extractives, with the heartwood, which is relatively high in extractives, indicates that in the green condition the maximum crushing strength in compression-parallel-to-the-grain is higher in the heartwood by an amount greater than that expected from a like increase in wood substance. This effect was most noticeable in black locust and least in western red cedar.

Green sapwood and heartwood show about the difference indicated by the calculated ratios for the modulus of rupture, while the increase in work to maximum load is considerably less than the computed value in each of the three species.

Toughness, which was tested only in redwood, is lower for the heartwood than for the sapwood, though the weight of the former would indicate considerably higher values.

Similar tests on air-dry specimens show approximately the same results, although the influence of extractives was less noticeable in air-dry than in green redwood.

Checks of the results were attempted in several ways. "Redwood heartwood from which extractives were partly removed by forcing cold water through the specimen was compared with adjoining unextracted wood. The outer portion of a kiln-dried redwood block in which the concentration of extractives had been increased by the transfer that is normal in kiln-drying was compared with an adjoining interior portion of lower extractive content." The results of the tests bore out the differences in strength noted between sapwood and heartwood.

Attempts to increase the maximum crushing strength by soaking specimens of redwood in a solution of redwood extractives, thus increasing the extractive content, were non-productive of results. The specific gravity was increased approximately 10 per cent, but the strength, though increased slightly, was not comparable to the increase in weight.

The results of the experiments reported lead to the conclusion that extractives

exert an influence on certain of the strength properties of wood, though there seems to be no logical reason why they should. The various strength properties are affected differently, extractives may affect different species differently, and the extractive content is not an indication of the strength changes that may result.

J. Elton Lodewick,
Pacific Northwest Forest Experiment Station.

An Anatomical Study of the Woods of the Philippine Mangrove Swamps. By Alexis P. Panshin. *The Philippine Journal of Science. Vol. 48, No. 2, pp. 143-205. Plates 24. June, 1932.*

The purpose of the paper is "to present in detail the gross and minute anatomical features of the woods of the Philippine mangrove forest; and, in addition, to show what influence, if any, a highly saline, and therefore, 'physiologically dry' habitat has had upon the wood structure of such littoral species."

At the beginning, descriptive terms are well defined. Twenty-four species are covered. They are arranged by family and genus and brief notes on each are included. The information for each species is classified under: Species; common name; local names; general description of wood; minute anatomy; remarks; material (source); uses.

A key to the woods based on macroscopic characters and one based on microscopic characters is given. The work culminates in a discussion and summary. Each species is illustrated by a plate showing a 15x and a 110x photo-micrograph of the transverse section of the wood.

The wood technology is unassailable, both the thorough and clearly defined descriptions of the woods, and the photomicrography. High-power photo-micrographs of the tangential and radial sections of course would have added much to the descriptive value of the paper. The technique seems to far out-shine the philosophy. The conclusions drawn from this study are "that habitat does not impress any definite type of anatomical structure upon different species." This, however, does not show whether or not habitat has had an influence on the wood structure of the species. The author does point out the logical steps that should be taken to investigate this problem to a more conclusive end.

The paper presents to the Philippine foresters a splendid anatomical study of some of their woods. The study was made while the author was at the N. Y. State College of Forestry and the report is a contribution from that institution.

Hereford Garland,
University of California.

Studies on Virgin Hardwood Forest: I — Density and Frequency of Woody Plants of Donaldson's Woods, Lawrence County, Indiana. By Stanley A. Cain, Indiana University. *Proceedings Indiana Academy of Science, pp. 105-122, Vol. 41, (1931) 1932.* [A limited number of reprints are available.]

"Primeval, or 'virgin' forests, timbered areas which have never been lumbered or grazed, are rapidly becoming exceedingly rare and of small area in the central hardwoods region."

The first six pages of the bulletin present a brief summary of plant community studies; a description of the Donaldson Woods and the field methods used. The latter is of special interest to the forester because permanent quadrats were established; which correspond very closely to the type of permanent sample plots that

have been and are being established by foresters in the region.

The results of the statistical study are well illustrated by tables and photographs. These are followed by a brief discussion of virgin forests. In the words of the author "virgin forests are uneven-aged, over-ripe old monarchs overtopping and choking off reproduction. Very striking, however, is the abundant reproduction in the small size classes; seedlings up to a foot or so in height and saplings one to three inches or so in diameter."

DANIEL DENUYL,
Purdue University.

Forest Land Use in Wisconsin. Report of the Wisconsin Committee on Land Use and Forestry. *Madison, Wisconsin, 1932. Pp. VII + 156.*

Wisconsin, according to this report, has 16,200,000 acres of land that will presently be in forests. Of this amount, 5,000,000 acres are already involved in some stage of tax delinquency; and "there are at least 9,000,000 acres of forest lands which the most hopeful analysis excludes from the possibility of private use." The report forecasts that private ownership will provide for only 2,000,000 acres in private forests, and that farm woodlots will make up the remaining 5,000,000 acres. The counties are expected to own a total of 7,000,000 acres out of the 9,000,000. In Wisconsin, tax delinquent land reverts to the counties.

It is thus apparent that Wisconsin has upon its hands a large problem in public ownership and management of forests. The people of the state seem fully awake to this situation. In 1928, a conference on commercial forestry was held in Milwaukee, the proceedings of which were published in a report entitled *Forestry in Wisconsin.* In 1929, an interim committee on forestry and public lands created by the Legislature reviewed the situation and recommended the adoption of a plan "under which the [state] Conservation Commission will work with county authorities on this project, just as the Highway Commission coöperates with county authorities on road matters." A 1931 interim committee on forestry, fires and tax delinquency made a further report. The present report is the work of a special committee set up by the executive council of the state, a body composed of twenty members, five from the Senate, five from the Assembly, and ten appointed by the Governor from among the citizens of the state, which had previously published reports on agricultural credit and on electrical power.

This special committee on forest use of land was composed of three representatives of the timber and wood-using interests of the state (Robert Goodman, John D. Mylrea, and James B. Nash), the directors of the Lakes States Forest Experiment Station and of the U. S. Forest Products Laboratory (Carlile P. Winslow and Raphael Zon), both of which are public agencies located in the region, and finally of the secretary of the executive council (John M. Gaus). The representatives of the industry were obviously men of broad views, able to think in terms of the public interest, for only in two or three places does one become aware of any private-interest bias, and in no place is it conspicuous. The report furnishes another example of the advantage of the Wisconsin plan of calling upon representatives of the industry, trade and labor when a course of public action is to be determined; and also of calling upon the best available specialists among the students of the problem. It is evident from the report that a number of competent and well-informed persons outside of the committee had a part in its preparation. Chapter 2 on use of land for agriculture is definitely credited to Professor George Wehrwein of the University of Wisconsin.

No doubt students of problems of for-

estry, taxation and land utilization will find of most interest the discussion of the Wisconsin Forest Crop Law, under which private agencies or governmental units such as the counties are permitted to register forest land for taxation at ten cents per acre per year, to which the state contributes a like amount, but levies thereon at the time of cutting a severance or yield tax fixed at ten per cent of the stumpage value of the products cut and removed. As applied to counties, according to legislation in 1931, the ten per cent received from the state is to be used for the "purchase, development, preservation and maintenance" of the county forest reserves, and a severance tax of seventy-five per cent of the value of the forest crop is imposed by the state. At the end of 1930, over 402,000 acres were entered under this law, and by the end of 1931, applications had been made for entry of 430,000 acres more.

A recent study made by the Lakes States Forest Experiment Station, published under the title "The Wisconsin Forest Crop Law in Practice" had made clear that most of the land being entered was of poor quality, either open or poorly stocked, and that the ten per cent severance tax collected on privately owned lands would not repay the state for its annual contribution of ten cents per acre on such land. Accordingly, the Conservation Commission made a new ruling in 1931 to the effect that only such land would be accepted for entry as promised to return to the state and the owner enough to justify such entry, and upon which the owner would pledge to practice forestry. The present report indicates that the owners of the poor forest land already entered are rapidly learning the folly of paying a ten-cent tax on such land, and are letting it fall back upon the counties. The 1931 provision for county forest reserves, the present report concludes, is not likely to work satisfactorily because the twenty-five per cent of the severance tax left for it, plus the ten cents per acre annually, is not sufficient to induce the counties to practice the intensive forest management required to make forestry profitable; and hence some change in the provisions is needed with respect to this. Basic to this latter statement is "the general rule that intensive forestry may pay where extensive forestry does not," quoted from the report cited above on the workings of Wisconsin Forest Crop Law. It is also recommended that the Forest Crop Law as applied to virgin timber, of which Wisconsin still has something less than a million acres, be changed so as to make the severance tax light for timber cut in the next few years, and increasingly heavier year after year, so as to make it feasible for the owners to enter it under the Law and still postpone cutting.

The picture which one gets from this report is that here is a state steadfastly pursuing a course laid out in the right general direction, having carefully surveyed the ground in advance, and stopping at intervals to take its bearings and re-examinate the terrain, which finally will surely attain its objective. The type of constructive progressivism which made Wisconsin one of the first states to develop a workable plan of working-man's compensation insurance, and a workable state income tax law, seems destined to make Wisconsin one of the first states to produce a workable and effective plan for taxing forest land and developing its forests.

This report is concerned with forest land utilization primarily. The reviewer is only an agricultural economist, and not competent to judge the merits of much of the analysis. Nevertheless it may be permissible for him to raise a few questions. The first is with respect to the degree of intensity of forestry that is most economical. The report calls for a classification and sub-division of the area of Wisconsin into agricultural areas, productive forest areas, and sub-marginal forest

areas. For the latter, policing, fire protection, and exclusion of settlers is recommended as the proper degree of intensity. For the second class, forest management is recommended that will include in addition the making of capital investments in planting, thinning, etc. The chapter on forest management contains details as to the methods of planting, stand improvement, and fire, disease and other forms of protection needed for this class of land. The reviewer wonders whether enough is yet known of the economics of forest management to determine the degree of intensity in forestry which is likely to prove most economical over the next fifty and one hundred years for which plans need now to be made. Agricultural economists certainly do not consider themselves competent to make such decisions for agriculture even in the next ten years. They now believe that their ideas of twenty years ago were mostly wrong. The most successful farms in most communities today are the most intensively cultivated ones; but no one in his right senses would recommend such intensive methods for all or even most farmers. Surely some value must be assigned to the experience of life which seems to have kept most of them relatively extensive. The experience of actual forestry may similarly teach us some wisdom with respect to degrees of intensity of forest management.

The reviewer would regret if the foregoing were interpreted as discrediting all attempts at land classification and subdivision; nevertheless a little more recognition of the limitations and difficulties of it would seem appropriate. Surely a large fraction of the land of Wisconsin can be put in one of the foregoing three classes only on the basis of very uncertain forecasts; and as to the part of it put in areas for intensive forest management, there must be equal uncertainty as to the degree of intensity of forest management that will later prove to have been wise.

The reviewer agrees in general with the position of the report that the economy of forest production must be judged on a sustained-yield basis and not on the assumption of starting a new forest and waiting for it to grow to saw-log size; and that timber operators should look upon reforestation of logged-off lands as part of their current operations. But one can expect timber operators to do this only if they see prospect of reasonably certain returns not too far distant. The great difficulty in Wisconsin is that the logging is already completed on most of the land, and planting is not yet begun, and one cannot expect timber operators to begin planting at this late date. The present report recognizes this situation realistically enough for the most part. There is a statement that at the best only a few of the remaining saw mills will be able to keep going till they can get onto a sustained-yield basis; and a discussion which indicates that the wood-pulp and other wood product industries will be much more likely than saw-log operators to find it profitable to get their holdings onto a sustained-yield basis. Mr. Zon's doctrine would indeed be valid in a country or continent with no virgin timber left; and we are rapidly approaching such a situation in effect in a considerable part of the United States. All that is needed is that costs of the virgin timber in more remote areas, plus transportation costs, amount to more than enough to make sustained-yield forestry attractive to capital in areas nearer to consuming centers.

In the meantime, public agencies must take care of the land, and this the Wisconsin report fully recognizes.

But it also properly recognizes that present methods of taxation of forest and cut-over lands do not give private operation of forests an equal chance with other forms of private operation, and in Chapter 7 outlines the changes in methods of public finance needed. It is pointed out

among other things that the general property tax when applied to such lands could only have failed because it was improperly administered, cut-over and forest lands in general being over-assessed, particularly the poorer of these lands.

Fire protection is frankly assumed to be a public function for the most part; and must be provided more adequately than at present if private enterprise in forestry is to have its chance.

The writer observes with interest that the discussion of "adequacy of forest acres" is solely in terms of area needed to provide wood for "the Wisconsin industries." Is it not reasonable to assume as a matter of national economy that Wisconsin and the other two Lake States will eventually need to supply timber and wood products for more territory outside their own boundaries than at present and that markets will be available for more than the product of the 7,000,000 acres indicated? This is a form of provincialism in economic planning which is common in discussions of land use emanating from the U. S. Department of Agriculture. It would be indeed unfortunate if the states were to fall into the same habit.

The report lays down boldly one bit of doctrine as to public land policy which the reviewer is disposed to accept, but would like to see widely debated: "If the forests did not yield a single stick of timber or a single stick of pulpwood, the use of the land for forests would still be economically justified." The other values to be realized are of course recreational, prevention of erosion and floods, water power, etc.

The final chapter in the report, on the essentials of a land-use program, outlines a definite program of action for the state, even to the details of "administrative organization and personnel." One observes here, however, that no changes in organization set-up are proposed. One must question whether some consolidation and simplification of existing boards and commissions would not be desirable—what with a "Conservation Commission," a "Commissioner of Public Lands," a "Department of Agriculture and Markets" which is making land economic inventories, and a "Regional Planning Committee"—in spite of what is said slightly in apology for them in the report.

JOHN D. BLACK,
Harvard University.

CORRESPONDENCE

Forest Fire Insurance in Japan

Editor, Journal of Forestry,

Dear Sir:

Professor Yatagai's interesting article in the January[1] Journal indicates that the development of forest fire insurance in Japan has, in a number of respects, quite closely paralleled the same development in this country.

A number of large and strong stock companies have been offering forest fire insurance in the United States since about 1920, some doing business over practically the whole country and some confining their activities to local regions.

As in Japan, however, these attempts have resulted in only a very small development of the business for substantially the same reasons. The premium rates charged are too high to attract most owners and underwriting practices are extremely conservative insofar as the experience and knowledge of the underwriters make possible. Just what proportion of the private forest ownership in the United States is insured is not known, nor is there available information on the classes of forest property insured, but it can be said with reasonable safety that the development is not greater than it is in Japan.

Another close parallel is the perception of the need of some practical research to determine the facts of forest fire losses from the insurance point of view. In this connection the United States apparently has taken the lead since the forest insurance study in the Branch of Research of the Forest Service, authorized under the Clark-McNary law, is attempting to do exactly the things that Professor Yatagai suggests should be done in Japan; that is, to compile the available data for insurance purposes, to construct a schedule of rational rates, and to investigate the hazards affecting fire risks.

No specific commitment has been made in this country as yet, however, as to what form of insurance carrier will be best adapted.

H. B. Shepard,
Pacific Northwest Forest Experiment Station.

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[1]Yatagai, M., History and Present Status of Forest Fire Insurance in Japan. Journal of Forestry, Vol. XXXI, pp. 79-84, January, 1933.

SOCIETY AFFAIRS

The Coming Election

Every two years the Society of American Foresters elects a new President, Vice President, and four new members of the Council. Such an election will be held in December of this year. The President and Council will shortly appoint a nominating committee to make up the slate, which must be published in the October issue of the Journal. It is in order, therefore, for the members of the Society to be making up their minds whom they would like to vote for next December, to fill these offices, and to be prepared to submit their recommendations to the nominating committee, as soon as its appointment is announced.

The procedure for nomination and election of officers and Council, as prescribed in Article VIII, of the Constitution, contemplates that the slate shall be made up primarily of nominations-by-petition and that the nominating committee's principal function shall be to make sure that nominations-by-petition are legally done. It should be required to make original nominations of its own only in case an insufficient number of nominations-by-petition are received (viz. at least twelve, and more is better) or the slate is not well balanced through lack of representation from certain parts of the country or branches of the profession. A nomination petition should be signed by ten voting members. No member may sign more than one petition.

It is the privilege and the duty of every voting member to play his part not only in the election of the Society's officers and Council but also in the nomination of the candidates for these offices. It is sincerely to be hoped that through the active participation of the maximum number of members the coming election will be the most representative and democratic one yet held by the Society.

Any request for further information will be promptly answered by the Society's Office.

Article VIII of the Constitution reads as follows:

"*Nomination and election of officers and Council:* Section 1. A nominating committee shall be appointed by the President, with the approval of the Council, not later than August 1 of the year in which an election is to be held. It shall be the duty of this committee (1) to nominate candidates to the extent of not more than twice the number of positions on the Council, including officers, to be filled at the forthcoming election; (2) to receive nominating petitions from the membership at large as provided in Section 2; (3) to cause to be distributed to the entire membership, at least ten weeks before the date of election, in the official organ of the Society or otherwise, its own nominations and any nominations by petition that may then be available, *provided* that no person shall be listed as a candidate at any time until the committee has received his written acquiescence; (4) to set the date of election, and announce it to the Society at least ten weeks in advance; and (5) to instruct the Secretary-Treasurer to submit during the sixth week prior to the date of election, to the voting membership for letter ballot,

all nominations made by the nominating committee or by petition.

Section 2. Nominations by petition shall be subject to the following conditions: (1) each petition shall name but one candidate; (2) all candidates must be eligible to hold elective office, including membership on the Council; (3) a petition shall bear the signatures of at least ten voting members of the Society who at the time of signing such petition are eligible to vote in the forthcoming election and who have not already signed a petition for any other candidate to be voted on at the same election; (4) petitions must be in the hands of the nominating committee by the end of the seventh calendar week prior to the date of election.

Section 3. All elections shall be by the Hare system of proportional representation. Candidates for membership on the Council, including all elective officers, shall be voted for in one group. The initial ballot count of such vote shall be conducted according to the usual quota method of the Hare system in such a way as to fill all Council positions, including officers, necessary to be filled at such election but without distinction as between the various positions. The successful candidates in this initial ballot count shall be declared members elect of the Council and as such become continuing candidates for election to any offices to be filled at the same election. A second ballot count shall then be made, in which the candidate receiving the majority quota shall be declared elected President and the candidate receiving the second highest vote shall be declared elected Vice-President."

FRANKLIN REED,
Executive Secretary,
On behalf of the President and Council.

NOMINATION AND ELECTION OF FELLOWS

About a year ago the question was raised if the procedure, as set forth in the Constitution, for the nomination and election of Fellows could not be greatly improved. The sentiment of the Society membership was sounded out through the sections. The general reaction was that the present procedure is inadequate and is in need of material improvement in order to insure the granting of the honor to those senior members who are actually entitled to it and to guard against its being conferred upon the undeserving. Detailed recommendations, however, as to just how this should be done were so varied, and often conflicting that the Council was forced to put the problem, for its solution, into the hands of a special committee.

The recommendations of this committee, involving Constitutional amendments, will shortly be submitted by the Council to a referendum of the total voting membership in the manner prescribed by Article XIII of the Constitution.

Preliminary to this step the Council would very much appreciate the individual advice and comment of such members as have not yet had opportunity to express their views in this matter.

The report of the committee follows:

Article III, Section 5, of the Constitution provides that "Fellows shall be foresters of outstanding achievement as leaders in responsible directive or distinctive individual work of a fruitful character." Doubt has arisen in the minds of many members of the Society as to whether this statement, which is obviously open to varying interpretation, is intended to restrict Fellowship to a very few men of preemient professional standing, or to include a substantial sprinkling of men who have been professionally successful and can fairly be rated as leaders in the field. Concretely, is the underlying conception

that election to Fellowship should be regarded as conferring a high honor, to be rarely bestowed, or as comprising a group lifted somewhat above Senior Members, as the latter are above Junior Members?

When the Constitution was adopted it was hoped that questions of policy such as these would be settled by the Society as a whole through its action on specific cases. There are indications, however, that this is not the case and that there are still wide differences of opinion among different members of the Society as to the basis of eligibility. As a result two men who are in complete agreement in their appraisal of the achievement of a candidate for Fellow may vote in opposite ways on his nomination.

Furthermore, even if agreement as to general policy existed, it would be difficult as the Constitution now stands to make that policy effective in practice. Theoretically the Society can draw the line on further elections wherever it chooses. Practically that is not the way it would work out. Most members would certainly rather vote for a man of whom they think well than vote against him, and would be particularly reluctant to vote adversely merely because they disapproved of the rate at which the number of Fellows was being increased. While the list of Fellows so far elected indicates that the policy up to this time has been one of marked conservatism, the committee believes that under the present Constitution, human nature being what it is, there will be an inevitable trend toward liberalizing the standard.

As things now stand, the desire on the part of admirers of individual men of major accomplishment to obtain recognition for them, combined with hesitancy on the part of members to vote against a man of whom they think highly even though they doubt the advisability of adding him to the list of Fellows, will lead to new elections. Each of these will serve both as a stimulus to further nominations and as a precedent for further enlarging the list; and the more this is done the feebler will become the influence of the earlier precedent in favor of reserving the grade as a means of conferring a peculiar and very high honor. Without some limitation as to the number of men who may be elected, the tendency toward progressive liberalization of the standard set up by earlier precedent is almost inevitable, no matter what standard the Society may adopt.

A study of the grade of Fellow in other scientific and technical societies has been made by the committee, but has not proved particularly helpful because of the exceedingly diverse use of the term. It is evident that no uniform practice exists in similar organizations which can serve as precedent for the development of a more definite policy for the Society of American Foresters.

The committee believes that a large majority of the Society favors the maintenance of a high standard of achievement which will make election to Fellowship a unique distinction. In its judgment this policy can be made permanently effective only by a constitutional limitation which will prevent an indefinite expansion in the number of Fellows. Such a limitation might be effected by limiting elections to a specified total number, to a specified number per year, or to a certain percentage of the total membership of the Society. The committee favors a percentage limitation to a fixed number because of its greater flexibility, and also favors setting a limitation to the number who may be elected at any one time in order to prevent too rapid an expansion to the maximum limit.

Concretely, the committee recommends the submission to the membership of constitutional amendments limiting the total number of Fellows to one percent of the voting membership (Junior Members, Senior Members, and Fellows) of the So-

ciety, and limiting elections to not more than two at any one time. In order to regularize elections and to emphasize their importance, it also recommends that biennial elections be held simultaneously with the election of officers and members of the Council. Finally, in order to make certain that elections are really representative of the will of the Society, it favors the addition of a provision to the effect that a total vote of one-half of those eligible to vote shall be necessary to elect. With the present proviso, which would be retained, to the effect that an affirmative vote of three-fourths of those voting shall be necessary to elect, it would still be possible for an individual to be elected to Fellowship with an affirmative vote of only 37½ per cent of the total number of members eligible to vote.

The following changes in the Constitution are therefore recommended:

Article III, Section 5: Add to the Section as it now stands the following sentence: "The total number of Fellows shall be limited to one per cent of the total number of voting members, and not more than two Fellows shall be elected at any one time."

Article IV, Section 4: Change the entire Section to read as follows: "Elections to the grade of Fellow shall be by letter ballot of the Senior Members and Fellows, and shall be held at the same time as elections of officers and members of the Council. In each case a total vote of one-half of those eligible to vote, and an affirmative vote of three-fourths of those actually voting, shall be necessary to elect."

These changes would probably necessitate the addition under Membership, Elections, of a by-law which might read as follows: "In case more candidates for the grade of Fellow meet the requirements for election as stated in Article IV, Section 4, than are eligible for election under the limitations specified in Article III, Section 5, the individual or individuals receiving the largest total number of affirmative votes shall be declared elected up to the limit of eligibility. Should two candidates receive the same total number of affirmative votes when only one is eligible for election, that candidate receiving the highest percentage of affirmative votes shall be declared elected. Should this percentage also be the same, the successful candidate shall be determined by lot, and the name of the other candidate shall automatically be resubmitted for ballot at the time of the next election for Fellows. No nomination for Fellow, whether made by petition or by the Council, will be submitted for ballot when no election is possible under the limitations expressed in Article III, Section 5."

The committee feels that these changes would not only make clear the desire of the Society to maintain a very high standard for the grade of Fellowship, but would also provide the machinery to make that policy effective. With respect to certain other suggestions which have been made, it does not favor (a) including service to the Society as a necessary qualification for Fellowship, (b) giving the Council authority to reject or endorse nominations by petition, or (c) transferring the power of election from the Senior Members and Fellows to the Council. It believes that the honor is one which should be conferred by vote of the groups indicated, and that sufficient safeguard upon that privilege is provided both by the limitations proposed in this report and by the power of the Council itself to make nominations.

In connection with the later point, the committee recommends that whenever nominations for Fellowship are submitted to the membership for ballot, the Council go over the list of Senior Members with a view to submitting nominations on its own initiative in order to assure action on

those men whom it regards as deserving consideration. In fact, the committee believes that the free exercise by the Council of initiative in the making of nominations will greatly improve the present situation, even without constitutional amendments, by injecting more competition into elections. The committee is strongly of the opinion that the submission of a considerable number of names for consideration at the same time will result in more discriminating action on the part of the voters than if only one or two names are submitted.

Finally, the committee recommends that the names of men nominated for Fellowship be submitted for ballot with no accompanying biography. It believes that any man whose achievements are sufficient to justify election should be sufficiently well known to the Senior Members of the Society so that a personal statement concerning him should be unnecessary. A sentence to this effect could be added to the by-law previously suggested, should this seem advisable.

HERBERT A. SMITH, *Chairman.*
(with a reservation)
S. T. DANA
ALDO LEOPOLD.

I am not in agreement with the recommendation of the last paragraph. In my opinion, a summary of their record of each candidate and a statement of the grounds on which the proponents rest their claim of outstanding achievement would be of material help to the voting membership, particularly when more candidates are up for consideration than can be elected.

HERBERT A. SMITH.

ACTION TAKEN ON FOREST EDUCATION REPORT

In connection with the report of the Committee on Forest Education, the following letter was sent by President Granger to presidents of institutions having forest schools:

"As head of an institution which includes a school of forestry, I am sure you will be interested in the very comprehensive report on forest education in the United States recently made and published under the auspices of the Society of American Foresters. The undertaking was made possible through a grant of $30,000 by the Carnegie Corporation of New York. The study was headed by Dean Henry S. Graves of the School of Forestry, Yale University, and Cedric H. Guise, Assistant Professor of Forest Management, Cornell University. The report has just been published as a book, 'Forest Education.'

"In a very searching and impartial fashion the study discloses the strong and weak elements in the forest education system in the United States. It is the purpose of the Society of American Foresters to follow up this report, impelled by a desire to be as helpful as possible in strengthening the system where it is weak. Ultimately the Society will no doubt set up a rating of the forest schools, as is done in some other professional fields by the professional societies. Such a rating will have the double purpose of improving the standards of professional education in forestry and furnishing a basis for determining the schools whose degrees will be accepted as qualifying a man, as to education, for membership in the Society.

"The Society commends the entire report to the heads of the institutions which include forest schools, both those in which the standards are satisfactory and those in which they are not. It desires to point out especially certain particularly important parts of the report, and for this purpose has excerpted them in the inclosed pamphlet. A complimentary copy of the book itself has been sent to your forest school.

"The Society, and I am sure the authors of the report also, will welcome any comments you care to make. The Society stands ready to be of assistance to the full extent of its capacity."

Classification of Attendance at Annual Meeting

Two hundred and eighty-seven men registered at the 32nd annual meeting of the Society of American Foresters in San Francisco, December 14-16, 1932. These can be segregated into organizations as follows:

University of California (includes 21 undergraduates)	33
Other universities (Faculty)	9
California State Division of Forestry	7
Forest organizations	17
Forest Service; R-5, Regional Office	25
Forest Service; R-5, field	65
Forest Service; other regions	35
California Forest Experiment Station	29
U. S. National Park Service	13
Bureau of Entomology	6
Bureau of Plant Industry, Blister Rust Control	3
Miscellaneous	17
Non-members	28
	287

Sixty-three registrants were from outside the State of California—an unexpectedly good showing considering the "hard times."

North Pacific Section Discusses Forest Labor

Fifty-six members and guests attended the meeting of the North Pacific Section, November 30, at Portland, Oregon.

Dr. Norman F. Coleman, president of Reed College at Portland and formerly active in the Four L. Organization, spoke on "History of Social Problems Affecting Those Employed in Forest Industries." He pointed out that the temporary character of logging operations both as to time and place has an adverse effect on the employees, often resulting in anti-social tendencies. The logger, haunted constantly by both the danger and the insecurity of his employment, very naturally develops a feeling of resentment toward his employer because he, as an individual, receives so little consideration.

Dr. Coleman very convincingly developed the thought that the remedy lies in giving the logger's personal rights fuller recognition by means of coöperative organizations between management and employees to give the worker a voice in determining how he shall live and the conditions under which he shall work. It was his contention that the most important product of an industry is the kind of men—citizens—that it turns out.

A discussion of the "Present Social Problems and Future Outlook Affecting Those Employed in the Forest Industries" was presented by Mr. W. C. Ruegnitz, president of the Four L. Organization, giving many interesting examples of the work and problems of his organization during the depression.

At a brief business session, the section members present voted to endorse the policy of employing an executive secretary for the parent society, as has been done the past few years. It appeared to be the opinion of those present that this course would be desirable even if it were necessary to solicit small contributions from members to obtain the funds required. Such contributions already have been requested for this year due to a temporary decrease in the regular income of the Society.

D. N. Matthews,
U. S. Forest Service, Reporter.

Northern Rocky Mountain Section Program

The Northern Rocky Mountain Section has started its winter program and seemingly is getting off to a good start. The subject for the program this winter will be "A Regional Forest Policy" as expressed in the "Copeland Report." The subject seems particularly pertinent at this time since the whole Service, and everyone interested in or connected with timber and timber products, is keenly interested in the economic aspect of the forestry situation of today.

Assistant Regional Forester, Elers Koch, opened the discussion on December 5 with a resumé of the Copeland Report, prefaced by some very interesting facts regarding the present situation of forestry and the lumber industry. We plan to follow up this meeting with papers and discussions which will take up each of the major phases of the report in turn; as Protection and Protection Standards, Silviculture, Recreation, Grazing, Finance, Resources with reference to supply and depletion, and Utilization and Planting from an economic standpoint.

At the meeting on December 5, the Section passed the following resolution, which was presented by Mr. Koch, with regard to the Blister Rust situation.

RESOLUTION

Whereas, the protection of the white pine stands in the Inland Empire Region from blister rust is considered the most urgent and immediately pressing forestry need of the region,

And Whereas, the directors of the American Forestry Association have undertaken to advocate adequate appropriations from the federal government to control the disease,

Be It Resolved, that the Northern Rocky Mountain Section urge the Society of American Foresters to give their active support as an organization to a campaign to secure the needed appropriations to meet this emergency.

Northern Rocky Mountain Section Meeting, December 19

Dean Line of the School of Business Administration of the University of Montana addressed the Northern Rocky Mountain Section on December 19 on the bearing of the present economic situation on administration of public natural resources.

He referred in a most interesting manner to a number of the salient features in our present economic situation.

As applied to the forestry problem, he pointed out that in spite of all substitutes we will always be consumers of wood; we will continue to need grazing land and perhaps the greatest use to which the national forests will be put will be the recreational use by continually increasing numbers of our population with more leisure.

Can the nation afford to pay for the administration of the national forests? From a profit seeking business viewpoint, probably not. Clamor for tax reduction may require reducing our present budgets. However, the question will ultimately be decided on the basis of what is best eventually for society, and socialized progress will justify the necessary expenditures for forest administration.

Fred Mason,
Reporter.

Northern Rocky Mountain Section Meeting, January 23

At the meeting of January 23, the section went on record with reference to the apparent discrimination against the use of wood in federal construction. A commit-

tee appointed to investigate the matter found that the supervising architect was not guilty of such discrimination, but that in "farming out" bids and specifications to local architects wood was often ignored for uses in which it is admittedly the better material. Wood is often pushed out by the practice of calling for bids on alternate specifications; i.e., wood in one set and steel concrete and other substitutes in the other, when the latter class of materials win through cheaper but not always as good construction.

Although the title of Mr. Hornby's paper was "Some Problems in the Distribution of Fire-Control Effort," his talk primarily developed some answers to many of these problems.

After a brief description of some of the factors affecting the distance at which small smokes can be discovered, Hornby developed his main theme by analyzing the term "fire danger." Beginning with the commonly accepted factor of frequency of occurrence of fires, the speaker showed the fundamental importance of rate of spread of fire (fuels) and of damage as two additional components. Furthermore, the importance was shown of providing to meet peak loads of fires in one or two days, rather than the average of the annual number for any unit of area. And with further reference to frequency of occurrence, Hornby pointed out the fact that our fire records represent only the fires that were found by the smokechasers, whereas effort is usually spent, and must be provided, for 20 per cent to 30 per cent more fires which are discovered, which must be chased but which are not found.

H. T. Gisborne,
Reporter.

Past Meeting Places of the Society

1916—New York, N. Y.
1917—Pittsburgh, Pa.
1918—Baltimore, Md.
1919———.
1920—New York, N. Y.
1921—Toronto, Ont., Canada.
1922—Boston, Mass.
1923—Baltimore, Md.
1924—Washington, D. C.
1925—Madison, Wis.
1926—Philadelphia, Pa.
1927—San Francisco, Calif.
1928—New York, N. Y.
1929—Des Moines, Iowa.
1930—Washington, D. C.
1931—New Orleans, La.
1932—San Francisco, Calif.

In 1915 (October) the Society met in San Francisco, the occasion being a joint meeting of the Pacific Logging Congress, the Western Forestry and Conservation Association, and the Society in connection with the Panama-Pacific Exposition. The attendance was large, though the meeting was not a regular annual gathering.

Prior to 1916 the Society held no annual meetings as they are understood at the present time. It was not until 1911 that the Constitution provided for an "annual meeting," though none were held until 1916. Since then annual meetings were held regularly and coincidently with those of the American Association for the Advancement of Science, with several exceptions.

Photograph of Dr. B. E. Fernow

By arrangement with Mrs. Oliva R. Fernow, widow of Dr. Fernow, individuals or institutions desiring enlargements of the photograph which was published on the cover of the *Yale Forest School News* for January, 1933, or of another photograph in profile taken at a later date, can obtain the same from N. Snellenburg & Co., Market Street, Philadelphia, Pa., for $1.00. The

ize of the enlargement is 6½ x 8 inches. Mrs. Fernow, who is 81 years old, is aking an 8 months' trip to visit her late husband's relatives in Germany. This courtesy is extended because of several inquiries for the photograph of the founder of the profession of forestry in the United States.

Elections to Membership

The following men have been elected to the grade of membership indicated.

APPALACHIAN SECTION

Junior Membership

Kramer, Wm. P.

Senior Membership

Rupp, George F.

CALIFORNIA SECTION

Senior Membership

Black, S. Rexford
Corson, Carlyle W.
Douthitt, Fred D.
Edmonds, Marc W.
Elliott, Joseph E.
Hanson, Percy D.
Kevin, Paul R.
Nelson, DeWitt
Rider, W. B.

GULF STATES SECTION

Junior Membership

Tannehill, G. M.

NEW ENGLAND SECTION

Senior Membership

Faull, Joseph H.
Parker, S. E.
Rand, Ernest A.

NEW YORK SECTION

Senior Membership

Connell, A. B.

NORTHERN ROCKY MOUNTAIN SECTION

Junior Membership

Mackay, Edward

NORTH PACIFIC SECTION

Junior Membership

Steele, Foster

OHIO VALLEY SECTION

Junior Membership

Baker, J. C.
Peterson, Lyall E.

OZARK SECTION

Senior Membership

Shaw, A. C.

SOUTHEASTERN SECTION

Junior Membership

Cleveland, Grady G.

Senior Membership

Sebring, Harold M.

SOUTHWESTERN SECTION

Senior Membership

Bond, Willard F.

U. S. POSSESSIONS

Senior Membership

Sulit, Carlos

FOREIGN

Corresponding Membership

Neethling, Ernest J.

Announcement of Candidates for Membership

The following names of candidates for membership are referred to Junior Members, Senior Members and Fellows for comment or protest. The list includes all nominations received since the publication of the list in the February Journal, without question as to eligibility; the names have not been passed upon by the Council. Important information regarding the qualifications of any candidate, which will enable the Council to take final action with a knowledge of essential facts, should be submitted to the undersigned before April 15, 1933. Statements on different men should be submitted on different sheets. Communications relating to candidates are considered by the Council as strictly confidential.

FOR ELECTION TO GRADE OF JUNIOR MEMBERSHIP

Name and Education	*Title and Address*	*Proposed by*
Augustine, William B. U. of Calif., B.S.F., '30.	Insect control work, U. S. Forest Service, Placerville, Calif.	California Section
Ball, James Curtis U. of Calif., B.S.F., '31.	Engineering work, Sequoia, N. F., (temporary), 1364 Scenic Ave., Berkeley, Calif.	California Section
Bidwell, Charles Bradford Yale U., B.S., '31; M.F., '32.	Field Assistant, Appalachian Forest Exp. Sta., Box 137, New Haven, Conn.	Appalachian Section
Bottcher, R. A. 2½ yrs., Electrical Engineering, Wash. State College.	Assistant, planning forest protection system, R-6, U. S. Forest Service, Portland, Ore.	North Pacific Section
Cummins, William F. Ore. State Agric. College, B.S.F., '30.	Field Assistant, Office of Forest Pathology, Portland, Ore.	North Pacific Section
Eckes, Alfred E. N. Y. State College of Forestry, B.S., '30; Yale U., M.F., '31.	Recreational land economic survey work, 22 Wicks St., Yonkers, N. Y.	New York Section
Frankland, James U. of Wash. (3 yrs. C.E.), '14.	Regional Engineer, U. S. Forest Service, Portland, Ore.	North Pacific Section
Friend, Roger Boynton Mass. Agric. College, B.S. (Entomology), '23; Yale U., Ph.D. (Zoology), '27.	Assistant Entomologist, Conn. Agric. Exp. Sta., and Assistant Professor of Forest Entomology, Yale U., New Haven, Conn.	New England Section
Griffin, D. B. Penn State, 2 yrs.; N. C. State, B.S.F., '31.	District Forester, Pocahontas District, Bramwell, W. Va.	Allegheny Section
Hicks, Halsey M. Haverford College, B.S., '29; Yale U., M.F., '32.	Assistant, Yale Forest, Stafford Springs, Conn.	New England Section
Hicks, Vernon E. U. of Mich., B.F., '32.	Field Assistant, Appalachian Forest Exp. Sta., Asheville, N. C.	Appalachian Section
Jackson, Seth Cornell U., B.S.F., '26.	Unemployed, 8629—143rd St., Jamaica, N. Y.	New York Section
Johannsen, Paul L. U. of Calif., B.S.F., '31.	Field Assistant, Calif. Forest Exp. Station, Glendale, Calif.	California Section
Maher, Jerome Owen Penn State, B.S., '31; Yale U., M.F., '32.	Landscape Gardner, Yale Landscape Department, Woodmont, Conn.	New England Section
Mann, Jesse M. Common School, 1 yr. High School, correspondence course.	Supt. road construction, Columbia, N. F., Vancouver, Wash.	North Pacific Section
Olsen, Orange A. High School.	In charge fish and game work, R-4, U. S. Forest Service, Ogden, Utah.	Intermountain Section
Pearce, Irving Franklin San Jose State, '27-'29; U. of Calif., B.S.F., '31.	Research work in silviculture and Technical Assistant, Dept. of Forestry, U. of Calif., Berkeley, Calif.	California Section
Rhoads, Judson Melvin U. of Calif., B.S.F., '31.	Park Ranger, Lassen Volcanic N. P., Mineral, Calif.	California Section
Rogers, Nelson F. N. Y. State College of Forestry, B.S., '32.	Graduate student, New York State College of Forestry, 149 Lynhurst Avenue, Syracuse, N. Y.	New York Section
Simmons, Frederick C. Cornell U., B.S.F., '28; Yale U., M.F., '31.	Unemployed, 447 Fulton Street, Waverly, N. Y.	New York Section
Spring, John Bowman Cornell U., '26-'28; U. of Calif., B.S., '32.	Graduate work, Yale School of Forestry, New Haven, Conn.	New England Section
Switzer, Harry Diehl Mich. State, B.S.F., '29; Cornell U., M.F., '31.	Charge of technical service and mill control, also scaler, Escanaba Paper Company, Escanaba, Mich.	Ohio Valley Section
Tallmon, Willard Burton U. of Calif., B.S.F., '30.	Registrar, Shasta N. F., 2277 Cedar St., Berkeley, Calif.	California Section
Will, William F. Colo. Agric. College (Short Course).	Forest Planting Assistant, Wind River Nursery, Stabler, Wash.	North Pacific Section

FOR ELECTION TO GRADE OF SENIOR MEMBERSHIP

Name and Education	*Title and Address*	*Proposed by*
Harmon, Raymond U. New York State College of Forestry, B.S., '22 (Junior Member, 1924).	Assistant Supervisor, Superior N. F., Park Falls, Wis.	Wisconsin Section
Hurst, E. B. New York State College of Forestry, B. S., '23 (Junior Member, 1928).	Forester, Consolidated Water Power and Paper Co., Wisconsin Rapids, Wis.	Wisconsin Section
Osborn, Minott Lowry Conn. Agric. College, B.S., '20; Yale U., M.F., '22 (Junior Member, 1923).	Forest Supervisor, Jicarilla Indian Reservation, Dulce, Rio Arriba County, N. M .	Southwestern Section
Tyler, John N. Brown U., '23; Yale U., '25 (Junior Member, 1929).	District Forester, Tennessee Forest Service, Chattanooga, Tenn.	Appalachian Section
Watkins, Tom B. W. Pa. State, B.S.F., '16 (Junior Member, 1924).	District Forester, Tennessee Forest Service, Harriman, Tenn.	Appalachian Section

C. F. KORSTIAN,
Member of Council in Charge of Admissions.

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Vice-President, JOHN D. GUTHRIE, Forest Service, Portland, Oregon.
Secretary-Treasurer, PAUL G. REDINGTON, Biological Survey, Washington, D. C.

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The Council consists of the above officers and the following members:

	Term expires		Term expires
RALPH S. HOSMER	Dec. 31, 1933	E. L. DEMMON	Dec. 31, 1935
CLIFTON D. HOWE	Dec. 31, 1933	A. F. HAWES	Dec. 31, 1935
STUART B. SHOW	Dec. 31, 1933	C. F. KORSTIAN	Dec. 31, 1935
CLAUDE R. TILLOTSON	Dec. 31, 1933	HUGO WINKENWERDER	Dec. 31, 1935

Member in Charge of Admissions

C. F. KORSTIAN

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F. W. REED, *Executive Secretary*

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K. E. Pfeiffer, Vice-Chairman, Asst. State Forester, 1411 Fidelity Bldg., Balto., Md.
H. F. Round, Secretary, Forester's Office, Pa. R. R. Co., Philadelphia, Pa.

Appalachian

Dr. J. V. Hofmann, Chairman, N. C. State College, Raleigh, N C.
J. H. Buell, Vice-Chairman, Appalachian Forest Experiment Station, Asheville, N. C.
I. H. Sims, Secretary, Appalachian Forest Experiment Station, Asheville, N. C.

California

S. B. Show, Chairman, U. S. Forest Service, San Francisco, Calif.
George Cecil, Vice-Chairman, Chamber of Commerce, Los Angeles, Calif.
Russell Beeson, Secretary, U. S. Forest Service, San Francisco, Calif.

Central Rocky Mountain

John H. Hatton, Chairman, U. S. Forest Service, Denver, Colo.
H. D. Cochran, Vice-Chairman, U. S. Forest Service, Denver, Colo.
Lynn H. Douglas, Secretary-Treasurer, U. S. Forest Service, Denver, Colo.

Gulf States

G. H. Lentz, Chairman, 600 Stern Bldg., New Orleans, La.
P. M. Garrison, Vice-Chairman, Bogalusa, La.
Robert Moore, Secretary, University Station, Baton Rouge, La.

Intermountain

Thornton G. Taylor, Chairman, Utah Agricultural College, Logan, Utah.
Arthur G. Nord, Vice-Chairman, U. S. Forest Service, Salt Lake City, Utah.
G. W. Craddock, Jr., Secretary, Intermtn. Forest & Range Exp. Sta., Ogden, Utah.

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L. W. Rees, Secretary-Treasurer, Div. of Forestry, University Farm, St. Paul, Minn.

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H. J. MacAloney, Secretary, Northeastern Forest Exp. Sta., 355 Prospect St., New Haven, Conn.

New York

H. P. Brown, Chairman, N. Y. State College of Forestry, Syracuse, N. Y.
H. C. Belyea, Secretary, N. Y. State College of Forestry, Syracuse, N. Y.

Northern Rocky Mountain

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Dr. E. E. Hubert, Vice-Chairman, University of Idaho Forest School, Moscow, Idaho.
G. M. DeJarnette, Secretary, N. Rocky Mt. For. Exp. Sta., Missoula, Mont.

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R. E. McArdle, Secretary-Treasurer, 514 Lewis Bldg., Portland, Ore.
Vice-Chairman, Oregon: F. P. Keen, 501 Lewis Bldg., Portland, Ore.
Vice-Chairman, Washington: W. G. Weigle, 4722 16th Ave. N. E., Seattle, Wash.
Vice-Chairman, British Columbia: F. M. Knapp, Forestry Dept., U. of B. C., Vancouver, Can.
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W. H. Moore, Secretary-Treasurer, c/o James D. Lacey Co., Jacksonville, Fla.

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Alfred E. Fivaz, Vice-Chairman, Bureau Plant Industry, Washington, D. C.
Perkins Coville, Secretary, U. S. Forest Service, Washington, D. C.

Wisconsin

Crosley A. Hoar, Chairman, U. S. Forest Service, Milwaukee, Wis.
William L. Barker, Jr., Secretary, U. S. Forest Service, Milwaukee, Wis.

IT MUST BE MORE THAN GOOD

The man who can do good work only when he "feels in the mood" isn't wanted. The method that "works only under ideal conditions" is seldom popular. And—so it is with forestry explosives! They must be *more* than good—*they must be dependable!*

The forester has found in Atlas Explosives dependability that insures accurate and predictable results under all conditions. He has found, too, that the work of the Atlas organization does not end with the *making* of dependable explosives but that Atlas service is of equal value in the selection of proper types and grades and the use of proper methods.

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We believe that he has every right to demand equally unfailing dependability from the products he uses.

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FOREST FIRE HOSE

IMAGINE A FORESTRY HOSE SO LIGHT that one man can carry and handle 500 feet with utmost ease, a hose that will not burst under 600 lbs. pressure, having just enough percolation or sweat to prevent burning when dragged over smouldering embers! In addition it will be flexible under pressure, non-kinking, having low friction loss and leakage so that as much as 7,000 feet can be used with a 60 gallon pump and still furnish a workable stream at the nozzle!

RANGER SPECIAL is just such a forestry hose! It can be used as many times as necessary. There is no limit to its life provided it is thoroughly dried after use and stored in a dry place.

WE HAVE MET FORESTRY MEN who tried a supposedly good linen hose some years ago. The hose did not stand up. This is because a specially constructed linen hose is necessary for outdoor forestry work—even 1st grade Underwriters' linen hose will not meet the requirements. RANGER Special has been developed during years of close contact with actual conditions of forest fire fighting, and it is this which has made it foremost!

THE PRICE OF RANGER SPECIAL deserves careful consideration. Besides being more suitable for the purpose, it will be found more economical than cotton rubber lined hose.

SPECIFY RANGER SPECIAL FORESTRY HOSE coupled with Brass Expansion Ring Threaded Couplings (double lug type) or Presto Aluminum Snap Couplings. We recommend the latter as being the best coupling for forestry work.

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